MX-62-129B

PRELIMINARY TECHNICAL MANUAL

INTERMEDIATE MAINTENANCE INSTRUCTIONS

RADIO SET AN/URC-98

(USED IN COMMUNICATIONS CENTRALS 106E-2A AND AN/MRC-107A FOR HAVE QUICK II MODIFICAITON)

RADIO SET AN/URC-99

(USED IN COMMUNICATIONS CENTRALS AN/MRC-108() FOR HAVE QUICK II MODIFICAITON)

Magnavox Electronic Systems Company
Contract No. F19628-84-C-0084

This Technical Manual supersedes TO 12R2-2URC-102, dated 1 April 1986

Distribution authorized to the Department of Defense and US DoD contractors only (Critical Technology) (1 June 1988). Other requests shall be referred to SM-ALC/MMEDT, McClellan AFB CA 95652-5609.

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TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 144 CONSISTING OF THE FOLLOWING:

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INTRODUCTION

This manual contains intermediate level maintenance instructions for the Radio Sets AN/URC-98 and AN/URC-99. This manual is divided into seven chapters as follows:

Chapter 1 General Information
Chapter 2 Special Tools and Test Equipment
Chapter 3 Theory of Operation
Chapter 4 Description of System Tie-in of Equipment and Accessories
Chapter 5 Maintenance of Control C-11816
Chapter 6 Maintenance of Mounting Base MT-6165

The content and format of this manual conform to the requirments of the following military technical manual specifications:

MIL-M-6675B (USAF) Manual, Technical: Intermediate Maintenance Instructions.

MIL-M-38784B Technical Manuals: General Style and Format Requirements.

CAUTION

Observe precautions for handling electrostatic discharge sensitive items

The equipment in this manual contains electronic components which are succeptible to damage by electostatic discharges. These items require special handling precautions to prevent electrostatic discharge damage. The processes which expose the electrostatic sensitive devices (ESD) to potential electrostatic discharge are marked with the follwing symbol, (ESD), and are preceeded by a caution. The MIL-STD-129 sensitive electronic device symbol is included in figures which contain ESD sensitive items or involve steps which are ESD critical. Whenever an ESD symbol is present, the ESD precautions in TO 00-25-234 must be observed, and the procedures must be followed as written. The following documents provide information on the nature of ESD and the handling of devices which are ESD sensitive.

TO 00-25-234 - General Shop Practice Requirements For The Repair, Maintenance, And Test Of Electronic Equipment.

DOD-STD-1686 - Electrostatic Discharge Control Program For The Protection Of Electrical and Electronic Parts, Assemblies And Equipment.

DOD-HDBK-263 - Electrostatic Discharge Control Handbook For Protection Of Electrical And Electronic Parts, Assemblies And Equipment.

INTRODUCTION - CONT.

The following abbreviations are used throughout this manual:

Abbreviation	Definition
ANVIS	Aviators Night Vision Imaging System
CNG	Change
COMSEC	Communications Security
EEPROM	Electrically-Eraseable Programmable Read Only Memory
ESD	Electro-Static Discharge
FMT	Frequency Management Training
F/S	Frequency/Status
GRD	GUARD
LRU	Line Replaceable Unit
M-P-G	MNL-PRESET-GRD
MWOD	Multiple Word-of-Day
NVG	Night Vision Goggle
SQ	Squelch
TOD	Time-of-Day
WOD	Word-of-Day

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SAFETY SUMMARY

The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel must understand and apply during many phases of operation and maintenance.

KEEP AWAY FROM LIVE CIRCUITS

Maintenance personnel must at all times observe all safety regulations. Do not replace assemblies or subassemblies while the power is connected. To avoid electrical shock, always remove power and ground a circuit before touching it.

DO NOT SERVICE ALONE

Under no circumstances should any person service or adjust the equipment except in the presence of someone who is capable of rendering aid.

RESUSCITATION

Personnel working with or near high voltage should be familiar with modern methods of resuscitation. Such information may be obtained from the Bureau of Medicine and Surgery.

OBSERVE ESD HANDLING PRECAUTIONS

Touching connector pins of subassemblies or circuit cards can cause corrosion or ESD damage. Prior to handling static-sensitive devices, personnel and equipment must be grounded to prevent static discharge damage to the device.

USE EXTREME CARE WHEN PROBING ELECTRONIC EQUIPMENT

When probing electronic equipment, use a test probe that has shielding around the shaft of the probe tip, only the extreme tip of the probe should be bare. Always use a test probe with as small of a probe tip as possible when probing circuit cards. If necessary to obtain a good connection, remove power, attach probe to test point, and then return power to the unit. Avoid counting pin numbers with the tip of the test probe, as arcing between pins may occur.

HANDLE ELECTRONIC EQUIPMENT CAREFULLY

Modules, subassemblies, and related components must not be set on bare wood, metal, or similar surfaces. Possible abrasion to plated area, or scratching or damaging of printed circuit board, circuit elements, or parts may occur. Always return the unit to the ESD packaging material before storing or transporting.

SAFETY SUMMARY - CONT.

The following cautions appear in the text of this manual and are repeated here for emphasis.

WARNING

Each cell of the battery pack in the mounting base is equipped with a rubber plug to release any over-pressure of hydrogen gas caused by charging. Should an over-pressure occur, leaking of battery acid is possible. Prior to removal of the battery pack, inspect it for cracks or breaks in the case or any evidence of leakage. Should signs of leakage or corrosion be visible, rubber gloves must be worn when removing the battery pack. (Page 6-12).

CAUTION

Remove the Divider/Audio board from the mounting base slowly as the P2 to J2 connector is attached. (Page 6-7).

CAUTION

Observe precautions for handling electrostatic discharge sensitive items. (Pages 5-12, 5-13, 5-14, 5-15, 5-16, 5-17, 6-13, 6-14, 6-15).

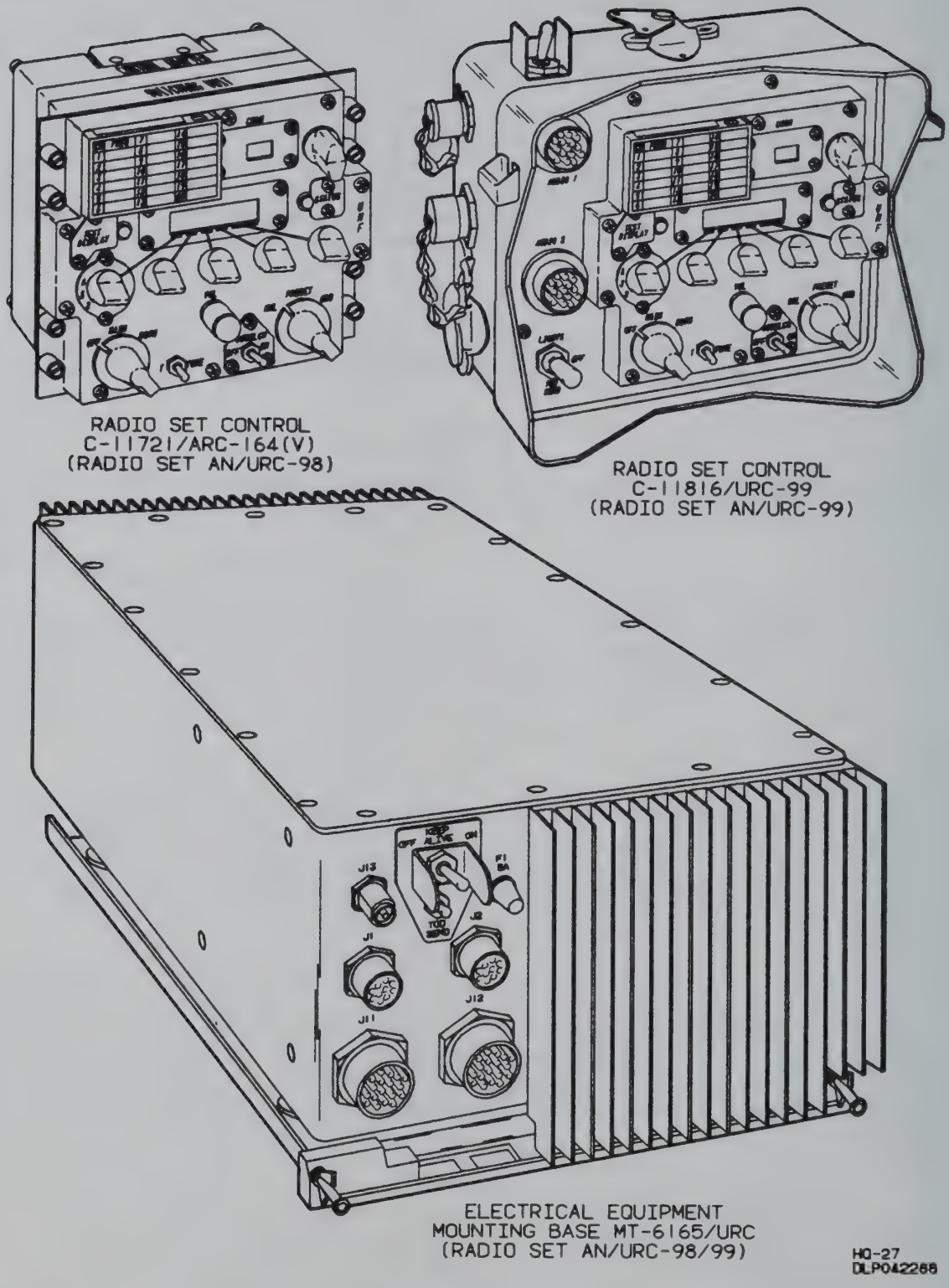


Figure 1-1. Have Quick II Radio Sets AN/URC-98 AND AN/URC-99

CHAPTER 1

GENERAL INFORMATION

Section I. EQUIPMENT DATA

1-1 DESCRIPTION.

The Have Quick II AN/URC-98 and AN/URC-99 radio sets consist of the Line Replaceable Units (LRUs) listed in table 1-1. The Have Quick II AN/URC-98 UHF radio set is used in Communications Centrals AN/MRC-107A and 106E-2A and utilizes the C-11721 control unit. The Have Quick II AN/URC-99 UHF radio set is used in Communications Centrals AN/MRC-108() and utilizes the C-11816 control unit. The receiver-transmitter RT-1504 and mounting base MT-6165 LRUs are common to both radio sets. Refer to TO 12R2-2ARC164-X2 for information on control C-11721 and RT-1504.

Table 1-1. Have Quick II AN/URC-98 and AN/URC-99 Radio Set LRUs

Line replaceable unit	Description/Application/Part number
C-11721/ARC-164(V)	UHF Control for AN/MRC-107A Comm. Central 900116-806
C-11816/URC-99	UHF Control for AN/MRC-108() Comm. Central 900168-801
MT-6165/URC	Mounting Base for UHF RT 707005-801
RT-1504/ARC-164(V)	Remote Mount UHF Receiver-Transmitter (RT) 707650-801

1-2 PURPOSE OF EQUIPMENT.

The radio set is designed to provide normal and jam-resistant (anti-jam or AJ) air-to-ground or ground-to-ground voice communications in the 225.000 MHz to 399.975 MHz UHF military band on 7000 separate channels. In a communications-jamming environment, the AJ mode enables the radio set to operate with other radios similarly equipped with the Have Quick AJ capability.

1-3 EQUIPMENT CHARACTERISTICS.

The Have Quick II AN/URC-98/99 radio sets provide a 7000 channel UHF tuneable receiver; an auxiliary guard receiver (nominally 243.000 MHz), and a 7000 channel, 10-watt carrier transmitter for normal AM voice and AJ mode communications. The Have Quick II radio set provides additional AJ improvements and features over the original Have Quick radio set as follows:

a. Two new frequency tables (NATO/Europe and non-NATO/Europe) and reserved memory space for a fourth frequency table in addition to the original A-net and B-net frequency table.

b. Multiple Word-of-Day (MWOD) loading capability which allows entry of up to six WODs for six days use.

c. Provides a connector to interface an electronic fill device for automatic MWOD loading.

d. MWOD erase capability.

e. Provides an expanded training net (Frequency Management Training net or FMT-net) in addition to the present T-net. FMT-net operation permits all users to share a common training WOD yet also provides the capability for regional allocation of the FMT-net frequency hopset (16 frequencies).

f. Addition of operational date information as part of Time-of-Day (TOD) message. This allows the radio set to initialize with the proper WOD.

g. Front panel liquid-crystal displays for channel and frequency information as well as other operator prompts.

h. Provides ANVIS green-A compatible front panel lighting for use with night vision goggle (NVG) equipment.

1-3.1 AJ Capability. The AJ mode of operation provides jam-resistant capability by taking advantage of the rapid tuning ability of the radio set. Automatically changing the frequency many times per second is a technique called frequency-hopping. To permit frequency-hopping, three special entries are required. These entries are word-of-day (WOD), time-of-day (TOD) and net number.

1-3.2 WOD. This programs the frequency-hopping rate and frequency-hopping pattern. The radio cannot function in the AJ mode without a valid WOD. In the Have Quick II radio set, the WOD data is now stored in non-volatile memory located in the receiver-transmitter SYNTHESIZER/ECCM assembly. Preset channels previously reserved for WOD storage (19 - 15) can now be used for normal preset operation, since the WOD does not take up preset memory. The WOD memory is still accessed through preset channel locations 20 through 14. WOD length may vary and may require anywhere from one to six channel locations (20 - 15). The seventh memory location (accessed by channel 14) stores day-of-month information. This date code works in conjunction with TOD and specifies which day the WOD is to be utilized. At midnight transitions, the radio set automatically generates a new frequency-hop pattern based on the new day's WOD. Up to six WODs may be entered at one time, allowing for

multi-day use of the radio set without installing another WOD. The radio set retains the six most recently entered WODs. If a WOD is entered which has a duplicate date as one which was previously entered, the new entry takes precedence and is identified as being the most recent entry. The procedure for loading multiple WODs is called MWOD loading. The radio set also has the capability to erase all stored MWODs.

1-3.3 TOD. TOD synchronization is necessary for communicating in the AJ mode. The TOD signal synchronizes all radios in the system that are using the same WOD so they can frequency-hop at the same instant in time. In the Have Quick II radio set, operational date information is added to the end of the TOD message. This information is necessary so the radio set can select the WOD with the same date. The radio set automatically accepts the first TOD signal received after power-up. Subsequent transmissions of TOD are ignored unless the operator enables the radio to receive a new TOD. The operator may also send TOD contained in his radio to other radios similarly equipped. TOD can be sent via a hardwire cable between two communications centrals. The hardwire cable is not supplied with the radio set and must be locally manufactured as shown in figure 1-2.

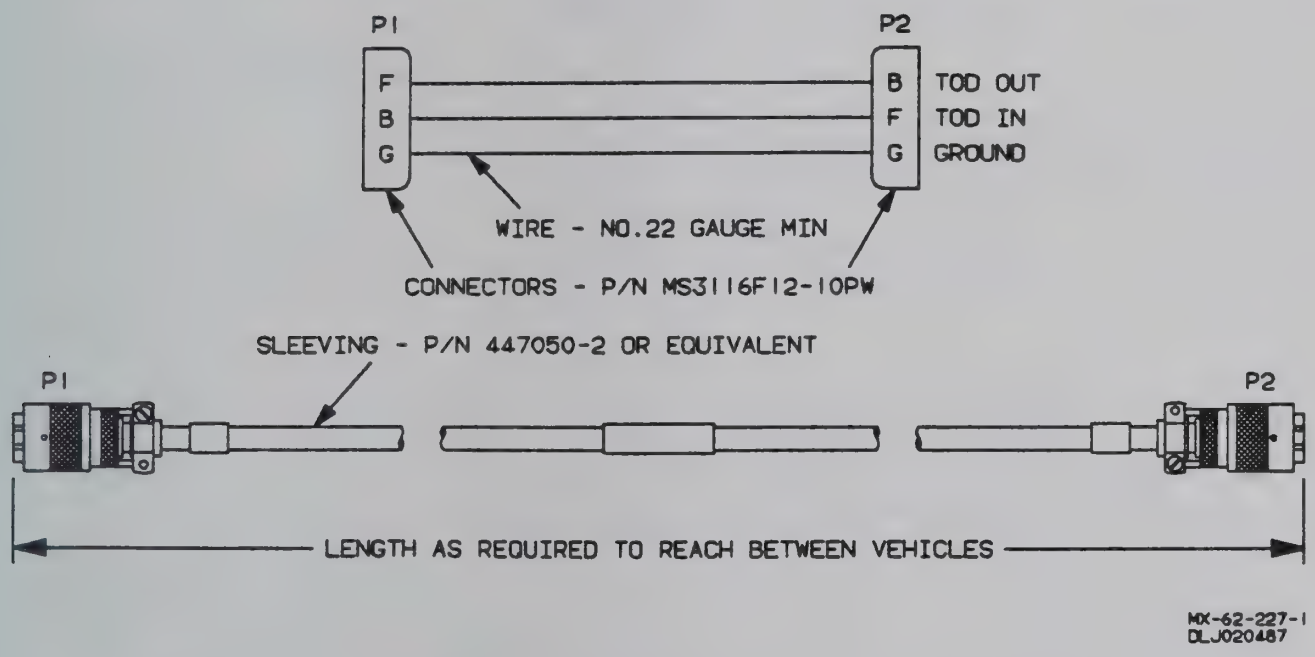


Figure 1-2. TOD Hardwire Transfer Cable Fabrication Diagram

1-3.4 Net Numbers. The net number is used in the AJ mode in the same fashion as a non-AJ mode frequency. The net number enables multiple station pairs to operate simultaneously on a non-interfering basis in the AJ mode while sharing a common WOD and TOD. The net number begins with an "A" and is followed by three digits "000" to "999". The last two digits of the display (00, 25, 50, 75) designate the frequency table being used. This permits 1000 possible net numbers for each frequency table. Net numbers ending in "00" select the original A-net and B-net frequency table. Net numbers ending in "25" select the NATO/Europe frequency table and net numbers

ending in "50" select the non-NATO/Europe frequency table. Net numbers ending in "75" are reserved for future use and will generate an invalid net alarm (pulsating warning tone). TRAINING MODE net numbers are designated as listed below. Selecting any other net number while operating on a TRAINING MODE WOD also generates the invalid net alarm.

A00000 through A00400 - Five original T-net numbers
A00025 through A01525 - Sixteen new FMT-net numbers

1-4 RADIO SET EQUIPMENT DATA.

Table 1-2 details equipment data for the Have Quick II radio sets.

1-5 EQUIPMENT SUPPLIED.

Table 1-3 lists equipment supplied for the Have Quick II radio sets.

1-6 RELATED PUBLICATIONS.

Table 1-4 lists related publications for the Have Quick II radio set.

Table 1-2. Radio Set Equipment Data

Characteristic	Description
RADIO SET CHARACTERISTICS:	
Alignment and Adjustment	None at organizational level, minimal at intermediate level
Altitude	50,000 ft (15.24 km) max
AM Voice and Tone Frequencies	225.000 to 399.975 MHz
Audio Interface Sets	Handsets H-33, H-138 or Control Group AN/GRA-6
Channel Spacing	25 kHz
Communications Systems	Communications Centrals AN/MRC-107A and 106E-2A (AN/URC-98) Communications Centrals AN/MRC-108() (AN/URC-99)
External Speaker/Amplifier	76F-3 or equivalent
Humidity	Up to 100% (including condensation on and in the equipment in temperatures up to +50 degrees C).
Intercommunication Set Termination	150 ohms +/-30% input impedance 600 ohm X-mode input impedance
Keyfill Device	KYK-13/TSEC
Memory Type	CMOS RAM, NMOS EPROM, NMOS EEPROM
Moisture	The C-11721 control and MT-6165 mounting base are rainproof. The C-11816/URC-99 control is watertight to a depth of three feet.
Non-Operating Temperature	-62 to +85 degrees C
Operating Modes	AM Voice Tone Secure Speech (KY-57/58 only in AJ mode) AJ
Operating Temperature	-54 to +55 degrees C (will operate for 30 minute intervals at +71 degrees C).
Operating Voltage	18 to 32 Vdc (with transient protection for up to 600 Vdc from 0 to 10 microseconds). 24 to 32 Vdc (Service Condition) 18 to 24 Vdc (Emergency Condition)

Table 1-2. Radio Set Equipment Data - CONT

Characteristic	Description
Physical Dimensions:	
MT-6165/URC (with RT-1504/ ARC-164(V) installed)	Width - 9.51 in. (24.16 cm) Height - 7.08 in. (17.97 cm) Depth* - 16.94 in. (43.03 cm) Weight - 35.50 lb. (16.08 kg)
C-11721/ARC-164(V)	Width - 5.75 in. (14.61 cm) Height - 4.875 in. (12.38 cm) Depth* - 5.34 in. (13.56 cm) Weight - 4.32 lb. (1.96 kg)
C-11816/URC-99	Width - 7.50 in. (19.05 cm) Height - 6.25 in. (15.88 cm) Depth* - 5.34 in. (13.56 cm) Weight - 5.31 lb. (2.41 kg)
* Depth dimension includes projecting controls and connectors.	
Power Consumption:	
MT-6165/URC (with RT-1504/ ARC-164(V) installed)	Receive - 105 watts Transmit - 240 watts
Radio Set Controls	20 watts
Preset Channels	Channels 1 - 19 available for Normal mode presets. Channel 20 is reserved for mode selection.
Receive Signal Sensitivity	Receives AM signals at levels between -101 dBm to +2 dBm
Reverse Polarity Protection	Protects circuitry from inadvertent connection to a dc power source of wrong polarity
RF Power Output	10 watts unmodulated output
Secure Speech Capability	Baseband mode
Secure Speech Equipment	TSEC/KY-58, TSEC/KY-57, TSEC/KY-28 (TSEC/KY-28 in normal mode only) and other related VINSON COMSEC equipment.
Shock	30 g's 11 milliseconds duration
Spectral Containment	99% +/-12.5 kHz of the carrier frequency
Time Keeping Accuracy	Maintains time to ±3 msec for one week without an update.

Table 1-2. Radio Set Equipment Data - CONT

Characteristic	Description
TOD Transfer Modes	UHF rf link and hardwire link in both Normal and AJ operating modes.
Tuning Capabilities	7000 channels
UHF Antenna	AS-1866/MRC-107 (URC-98) and AS-1404/PRC (URC-99) Receive Impedance - 52 ohm Transmit Impedance - 50 ohm
Vibration	5 g's at 2000 Hz
Warmup Time	Meets all operating requirements within 10.0 seconds after turn on. Internal rubidium oscillator requires approximately 10 minutes to reach normal operating temperature. Control displays require 3 minute warm-up time at -54 degees C.
X-Mode Input Impedance	600 +/-20% resistive impedance
RECEIVE CAPABILITIES:	
AGC	At 1000 microvolts antenna input modulated 30% at 1000 Hz, audio output variance is +5 dB/-4 dB from 4 microvolts to 0.5 Volts
Audio Distortion	10% maximum
Audio Frequency Response	Voice - +1, -3 dB of audio output X-mode - +/-3 dB (70 Hz to 20 kHz) Baseband - +/-3 dB (20 Hz to 12 kHz)
Audio Outputs	Voice - Ungrounded 150 or 600 ohm narrowband impedance (selectable) X-mode - 500 ohm impedance
Audio Output Power Levels	Voice - 200 mW minimum not to exceed 360 mW (test) X-mode - 2.00 Vrms across 500 ohms (rf input of 1000 microvolts modulated 90% at 1 kHz)
CLIMAX Compatibility Squelch	Squelch based on carrier-to-noise ratio for signals below -87 dBm +/-6 dB; Squelch based on AGC for signals above -87 dBm +/-6 dB
Input Impedance	Creates SWR of less than 2.5:1 on a 52 ohm transmission line

Table 1-2. Radio Set Equipment Data - CONT

Characteristic	Description
Selectivity	6 dB down from nominal frequency for frequencies 12 kHz from nominal; - 40 dB down from nominal frequency for frequencies 25 kHz from nominal
Sensitivity	4 microvolts (hard) for 10 dB (S+N)/N at 30% modulation at 1 kHz
Squelch Sensitivity	Carrier-to-noise ratio type, opens at signal level of 4 microvolts or less: Attack time: 50 ms max. (at 90% of steady state ON level) Release time: 150 ms max. (at 10% of steady state ON level)
Types of Reception	AM voice and tone AM narrowband data (baseband)
Vibration Modulation	2 dB maximum variation in output due to vibration
GUARD RECEIVE CAPABILITIES:	
Type	Fixed tuned crystal controlled UHF AM receiver
Audio Output	Common with main receiver, within +/-2 dB of main receiver
Frequency	Pre-adjusted 243.000 nominal operating frequency
Frequency Accuracy	+/- 7.5 kHz
Reception Types	AM voice and DF tone AM narrowband data (baseband)
Selectivity	6 dB down from nominal frequency for frequencies 30 kHz from nominal; 60 dB down from nominal frequency for frequencies 80 kHz from nominal
Speech Security Output	Isolated from main receiver; terminated in 600 ohm load

Table 1-2. Radio Set Equipment Data - CONT

Characteristic	Description
TRANSMIT CAPABILITIES:	
AM Modulation	At 1000 Hz and 0.7 Vrms input (measured with transmitter keyed), negative and positive modulation = 80% minimum
Carrier Distortion	10% maximum between 300 and 3500 Hz at ≤50% or 0.5 Vrms modulation
Carrier Noise Level	Greater than 40 dB below detected audio from carrier modulated 80% positive at 1000 Hz
Frequency Deviation	Less than 500 Hz from nominal frequency
Frequency Hop Settle Time	Within 2 kHz of center frequency in 7.5 msec
Modulator Input Impedance	150 ohms +/-30%
Output Power Level	10 watts (unmodulated output)
Peak Frequency Deviation	Less than 2.0 kHz at 1000 Hz with 80% positive modulation
Sidetone Distortion	15% maximum between 300 and 3500 Hz at ≤50% or 0.5 Vrms modulation audio input
Sidetone Output Level	At 0.7 Vrms transmit audio input voltage, greater than 100 mW sidetone output
Tone Modulation	At 1020 Hz, positive/negative modulation is 80% minimum
Transmitter Rise Time	90% rf power in 70 +/-10 ms (normal mode); no power output between 0 to 40 ms
Types of Transmission	AM voice and tone AM narrowband data (baseband)

Table 1-2. Radio Set Equipment Data - CONT

Characteristic	Description
CONTROL UNIT CAPABILITIES:	
Clock Format	32 pulses followed by blank period equaling 8 clock pulses
Clock Frequency	620 Hz +/-20%
Clock Output Levels	2.4 volts minimum for HI state, 0.8 volts maximum for LO state
Clock Phasing	Clock + and clock - are 180 degrees out of phase
Data Bit Identification	All data bits are negative logic, except bits 14 through 27 which are positive logic
Data Format	32 data pulses followed by blank period equaling 8 clock pulses
Data Output Levels	2.4 volts minimum for HI state, 0.8 volts maximum for LO state
Data Phasing	Data + and data - are 180 degrees out of phase

Table 1-3. Equipment Supplied

Nomenclature/ common name	Description and purpose
Remote RT RT-1504/ARC-164(V)	Provides the receive and transmit capabilities in both the normal and AJ operating modes for the radio set.
Signal Data Converter CV-3297/ARC-164(V)	Front slice of remote mount RT. Provides the necessary interface, through system wiring, between the RT, mounting base, control unit and other UHF communications system components.
Synthesizer/ECCM O-1793B/ARC-164(V)	The synthesizer (SYNTH/ECCM) slice generates the required injection frequencies for transmitting and receiving on the selected frequency in both normal and AJ operating modes. The tuning frequencies, receiver tuning, squelch control, and normal or AJ functions are generated in response to control unit switch settings. Word-of-day and time-of-day processing also occurs in the SYNTH/ECCM slice.
Guard Receiver R-1976/ARC-164(V)	Allows monitoring of the emergency guard channel. The guard receiver is a superhetrodyne receiver tuned to the emergency channel frequency of 243.000 MHz. The receiver can receive emergency broadcasts while the main receiver is tuned to a different frequency. The guard receiver is turned on and off from the switching unit.
Main Receiver R-1977A/ARC-164(V)	The main receiver is tuneable to any one of 7000 channels in 25 kHz increments in the frequency range of 225.000 to 399.975 MHz. When a frequency is selected at the switching unit, the SYNTH/ECCM slice automatically tunes the receiver to the selected frequency. The receiver provides normal AM voice as well as baseband data reception.
Transmitter T-1307A/ARC-164(V)	The transmitter is tuneable to any one of 7000 channels in 25 kHz increments in the frequency range of 225.000 MHz to 399.975 MHz. Control of the transmitter frequency is accomplished by the SYNTH/ECCM slice in response to switch settings of the switching unit. The transmitter provides a minimum of 10 watts CW RF output power in all RT operating modes. Transmitting modes include AM voice, tone, and baseband data.
Wiring Harness p/n 565090-802	Remote RT internal wiring flex circuit. Provides electrical interconnection between all slices of remote RT for all control and data signals necessary for operation of the RT.

Table 1-3. Equipment Supplied - CONT

Nomenclature/ common name	Description and purpose
Control Unit C-11721/ARC-164(V)	Provides remote control of RT-1504 in all Have Quick II AN/MRC-107A and 106E-2A Communications Centrals (AN/URC-98 radio set).
Switching Unit SA-2525/ARC-164(V)	Front panel assembly of the control unit. Provides all switching and control functions for RT mode selection and operation. Contains the interface circuit card which converts all front panel control information to a serial data signal for use by the RT. Displays provide operator with visual indications of operating modes and frequency selections.
Control Adapter MX-9708/ARC-164(V)	The control adapter provides internal operating power for the control unit.
Wiring harness p/n 568628-801	Control unit internal wiring flex circuit. Provides electrical interconnection between the switching unit, control adapter and external connector.
Control Unit C-11816/URC-99	Provides remote control of RT-1504 in all Have Quick II modified AN/MRC-108() Communications Centrals (AN/URC-99 radio set).
Front Panel assembly p/n 818916-801	The front panel assembly contains all the front panel operator controls for RT mode selection and operation. Displays provide operator with visual indications of operating modes and frequency selections. Also interfaces the operator handsets to the UHF radio set.
Interface CCA p/n 816192-801	The interface circuit card converts all front panel control information to a serial data signal for use by the RT.
Power Supply CCA p/n 918837-801	A power supply circuit card provides internal operating power for the control unit.
Wiring harness p/n 420163-801	Control unit internal wiring which provides electrical interconnection between the above assemblies and the external connectors.
Mounting Base MT-6165/URC	Provides rainproof mounting and adapts the RT-1504/ARC-164 for RT-742/ARC-51BX radio set replacement.
Rubidium Oscillator p/n 626404-1	A precision 10 MHz oscillator to maintain a long-term, accurate time-of-day signal.

Table 1-3. Equipment Supplied - CONT

Nomenclature/ common name	Description and purpose
Divider/audio CCA p/n 811397-801	Divides 10 MHz oscillator signal down to 800 kHz for use by the RT. Monitors oscillator frequency and detects oscillator failure. Provides charging current for +18Vdc battery and switchover to battery operation during power interruptions. Also buffers the receive audio signal from the RT for application to the handsets and speaker amplifier.
DC/DC Converter p/n 535299-1	Generates a +28 Vdc regulated output from input voltages ranging from +18 to +32 Vdc.
Power Supply p/n 538667-802	Provides +6.2 and +12 Vdc operating power for internal mounting base circuitry.
+18 Vdc Battery p/n 810077-801	Provides operating power during momentary power interruptions (15 minutes maximum).

Table 1-4. Related Publications

Technical order	Subject
TO 12R2-2ARC164-X2	Intermediate Maintenance Instructions for Have Quick II AN/ARC-164(V)
TO 12R2-2ARC164-33	Overhaul Instructions for AN/ARC-164(V) (Have Quick)
TO 12R2-2ARC164-33-1	Supplemental Overhaul Instructions for AN/ARC-164(V) (Have Quick II)
TO 12R2-2ARC164-34	Illustrated Parts Breakdown for AN/ARC-164(V) (Have Quick)
TO 12R2-2ARC164-34-1	Supplemental Illustrated Parts Breakdown for AN/ARC-164(V) (Have Quick II)
TO 31R2-2MRC107-2	Service and Circuit Diagrams for Communications Central AN/MRC-107A
TO 31R2-2MRC107-2-3	Service and Circuit Diagrams for Communications Central AN/MRC-107A with Have Quick Modification
TO 31R2-2MRC108-2	Service and Circuit Diagrams for Communications Central AN/MRC-108 and AN/MRC-108A
TO 31R2-2MRC108-2-2	Service and Circuit Diagrams for Communications Central AN/MRC-108/A/B with Have Quick Modification
TO 12R2-2URC-101	Operation Instructions for Have Quick II AN/URC-98/99
TO 12R2-2URC-103	Overhaul Instructions for Have Quick II AN/URC-98/99
TO 12R2-2URC-104	Illustrated Parts Breakdown for Have Quick II AN/URC-98/99
KAO-153A/TSEC	Operation Instructions for COMSEC Equipment TSEC/KY-28
KAO-168B/TSEC	Operation Instructions for COMSEC Equipment TSEC/KY-57/58
KAO-330A/TSEC	Operation Instructions for COMSEC Equipment KYK-13/TSEC

Section II. CONTROLS AND INDICATORS

1-7 CONTROLS, INDICATORS, AND CONNECTORS.

The controls, indicators and connectors of the radio set equipments are described in the following paragraphs. Refer to operators manual TO 12R2-2URC-101 for detailed operating procedures for the radio sets.

1-7.1 Radio Set Control C-11816/URC-99. The controls, indicators and connectors of control C-11816 are shown in figure 1-3 and the functions are detailed in table 1-5.

1-7.2 Mounting Base MT-6165/URC. The controls and connectors of the mounting base are shown in figure 1-4 and the functions are detailed in table 1-6.

1-7.3 Radio Set Control C-11721/ARC-164. Refer to TO 12R2-2ARC164-X2 for the controls, indicators and connectors of control C-11721.

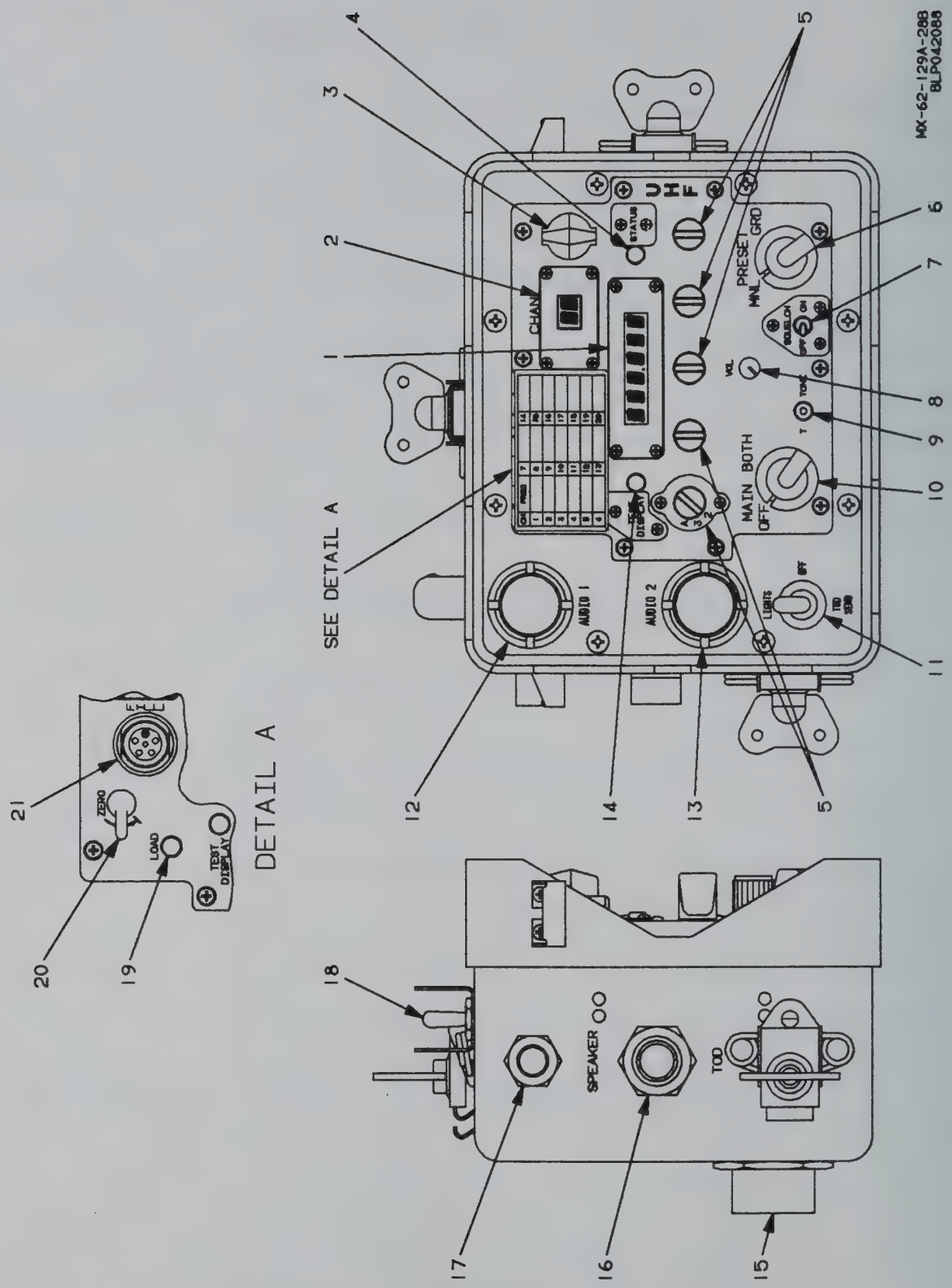


Figure 1-3. Control C-11816 Controls and Indicators

Table 1-5. Operating Controls and Indicators for C-11816 Control Unit

Reference (Fig. 1-3)	Nomenclature	Function
1	Frequency/status (f/s) indicator	Displays the individual frequency switch settings or any of the following operator prompts; see fig. 1-5 for further explanation of display information: VER/OP - Indicates radio set is in normal operating mode. M-LOAD - Indicates radio set is in MWOD load mode. ERASE - Indicates radio set is in MWOD erase mode. FMT.CNG - Indicates radio set is in Frequency Management Training Change mode. FILL - Indicates a keyfill device is connected to the front panel FILL connector. WOD OK - Indicates a valid WOD was successfully received from the keyfill device. BAD - Indicates no WOD or a bad parity WOD was received from the keyfill device.
2	CHAN indicator	Displays selected channel when M-P-G switch is set to PRESET or displays selected memory location when radio set is in the MWOD load or FMT-change operating modes (see fig. 1-5 for further explanation of CHAN display).
3	CHAN switch	Selects desired preset channel (1-20) during preset operation. Also selects the desired memory locations when radio set is in the MWOD load mode (20-14,1) or FMT-change mode (20-5).
4	STATUS switch	When pressed, initiates an alternate display on the f/s and CHAN indicators for five seconds (see fig. 1-5 for further explanation of STATUS switch).
5	2-3-A/Frequency switches	These switches select the corresponding hundreds, tens, units, tenths, and thousandths digits (as shown on the f/s indicator) for the desired frequency in normal mode, and the desired WOD elements or net number for AJ mode. In addition, the A position puts the radio set into the AJ frequency-hopping mode of operation when selected.

Table 1-5. Operating Controls and Indicators for C-11816 Control Unit - CONT

Reference (Fig. 1-3)	Nomenclature	Function
6	MNL-PRESET-GRD (M-P-G) switch	Determines the method of frequency selection as follows: MNL - Frequency is manually selected using the five frequency switches. PRESET - Frequency is selected using CHAN switch. Along with LOAD switch, also used when programming the 20 preset channels. GRD - Automatically tunes the radio set main receiver and transmitter to the guard frequency (243.000 MHz) and disables the guard receiver.
7	SQUELCH ON-OFF switch	Enables and disables squelch (noise quieting) of radio set main receiver.
8	VOL control	Adjusts audio level in H-33F/PT handsets connected at AUDIO 1 and AUDIO 2 connectors.
9	T-TONE switch	This is a three position toggle switch (middle position normally off) with two of the positions being spring-loaded. In the TONE position, transmits a 1020 Hz DF tone on the selected frequency and will stop when switch is released. If radio set TOD clock is started, transmits TOD message data followed by DF tone. In the T position, enables reception of TOD message for one minute. The T-TONE switch also initiates emergency TOD clock start, loads MWOD elements, erases MWOD elements and loads FMT-net operating frequencies when is in the respective MWOD operating mode.
10	Function switch	Selects the overall radio set operating function (OFF-MAIN-BOTH) as follows: OFF - Shuts down the equipment. MAIN - Enables main receiver and transmitter. BOTH - Enables main receiver, transmitter and guard receiver.
11	LIGHTS-OFF-TOD SEND switch	In LIGHTS position, illuminates the front panel lighting. In TOD SEND position, enables radio set to send a hardwire TOD signal.

Table 1-5. Operating Controls and Indicators for C-11816 Control Unit - CONT

Reference (Fig. 1-3)	Nomenclature	Function
12 & 13	AUDIO 1/AUDIO 2 Connectors	Connects two H-33F/PT handsets or the AN/GRA-6 Control Group to the UHF radio set.
14	TEST DISPLAY switch	Lights all segments of the f/s and CHAN indicators when pressed.
15	Signal/Power connector J1	Connection point for radio set signal/power cables.
16	TOD Connector J3	Connects an external time-of-day source to radio set for hardwire TOD transfers.
17	SPEAKER connector J2	Connects DC power and audio signals to External Speaker/Amplifier 76F-3.
18	KEEP ALIVE switch	Connects power (both external jeep and internal batteries) to the radio set keep-alive circuits to prevent loss of TOD during power interruptions.
19	LOAD switch	Loads frequency data displayed on f/s indicator into preset channels 1-19 as selected by CHAN switch. Preset channel 20 is reserved for loading MWOD operating mode data (220.0XX).
20	ZERO switch	Erases all Multiple Word-Of-Day (MWOD) elements when rotated to ZERO position.
21	FILL connector	Interconnects a KYK-13/TSEC keyfill device to radio set for automatic loading of MWOD.

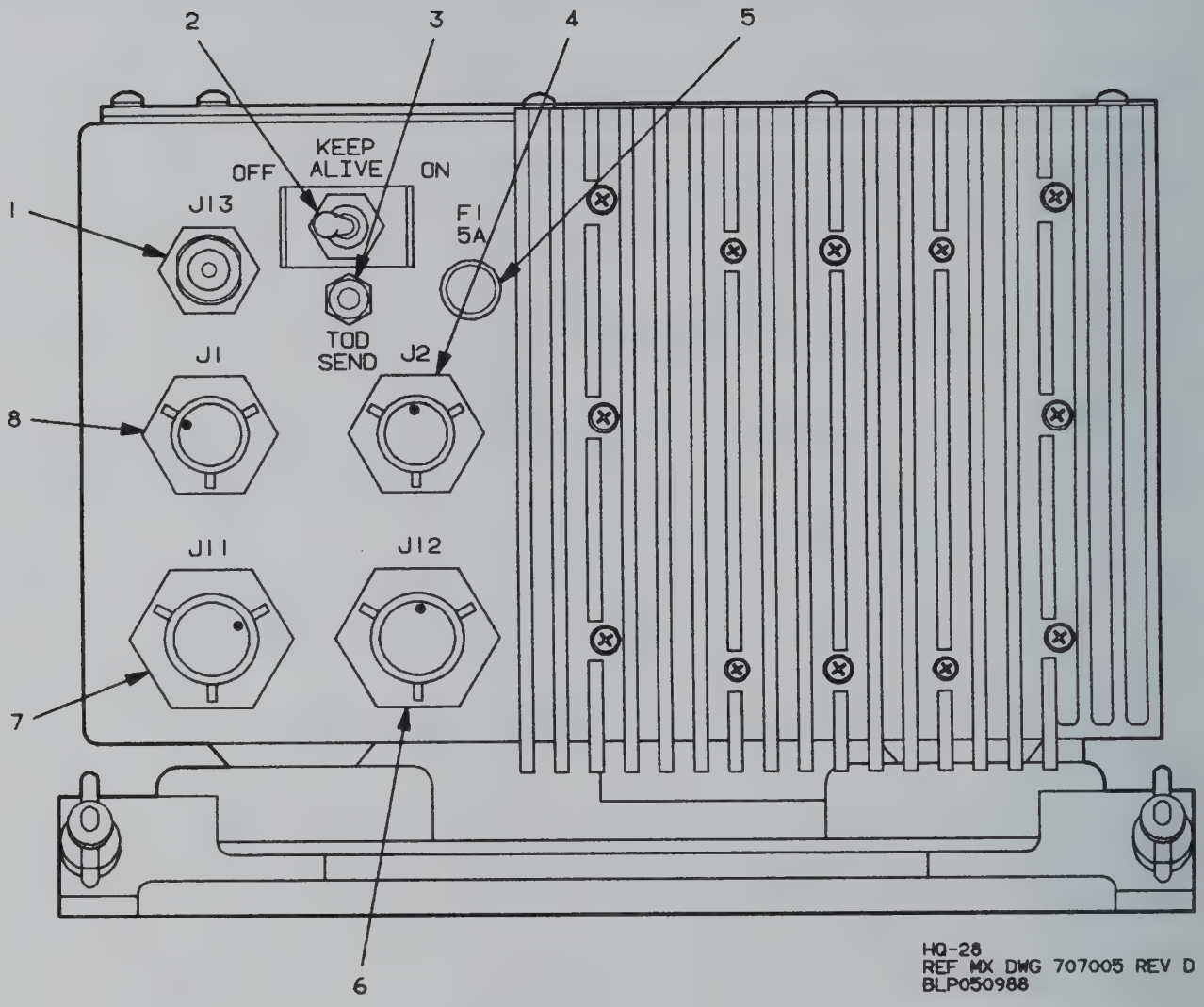


Figure 1-4. Mounting Base MT-6165/URC Controls

Table 1-6. Operating Controls for MT-6165 Mounting Base

Reference (Fig. 1-4)	Nomenclature	Function
1	Antenna Connector J13	Connects UHF antenna cable to radio set.
2	KEEP ALIVE ON-OFF switch	Connects power (both external jeep and internal batteries) to the radio set keep-alive circuits to prevent loss of TOD during power interruptions. NOTE If it is necessary to shut down radio set primary power for an extended period of time, set the switch to the OFF position to prevent drainage of the vehicle's battery. This KEEP ALIVE switch is not used in the URC-99 radio set and should always be in the OFF position. Keep alive operation for the URC-99 radio set is accomplished using the KEEP ALIVE switch on the C-11816 control.
3	TOD Send switch	Initiates a hardwire TOD transfer when pressed.
4	Keep Alive power connector J2	Connects cable from vehicle battery/external generator power source to maintain radio set operation when normal operating power is lost.
5	Fuse F1 5A	A five ampere fuse which limits the current drain of the internal circuitry of the mounting base.
6 & 7	Signal/Power connectors J11/J12	Connection point for radio set signal/power cables.
8	Time-of-Day Connector J1	Connects an external time-of-day source to radio set for hardwire TOD transfers.

CONDITION							MAIN DISPLAY		CHANNEL DISPLAY	
							NORMAL	STATUS	NORMAL	STATUS
RADIO OFF							[blank]	[blank]	[blank]	[blank]
RADIO ON	DISPLAY TEST ON OR POWER UP						▩▩▩.▩▩▩	▩▩▩.▩▩▩	▩▩	▩▩
	DISPLAY TEST OFF & NOT POWERUP	RADIO UNDER REMOTE CONTROL					REM OTE	REM OTE	[blank]	[blank]
		RADIO UNDER LOCAL CONTROL	FILL DEVICE ON	WOD REQUESTED OR NO WODS RECEIVED			FI LL	[freq sw.]	[chan]	[chan]
				BAD PARITY WOD RECEIVED			BA D			
				GOOD PARITY WOD RECEIVED & PASSED TO SYNTHESIZER			WOD OK			
			FILL DEVICE NOT ON	PRESET 20 = 220.050 OR ERASE SWITCH ROTATED			ERA SE			
				PRESET 20 = 220.025			M-L OAD			
				PRESET 20 = 220.275			FMT.CHG			
				PRESET 20 ≠ 220.025 .050 .075	MPG ≠ PRESET		[freq sw.]	[tuning freq or net]	[blank]	[chan]
					MPG = PRESET	FREQ SW. ≠ 2xx. xxx 3xx. xxx OR CHANNEL ≠ 20 OR PRESET 20 ≠ 220. 000			[chan]	
						FREQ SW. = 2xx. xxx 3xx. xxx & CHANNEL = 20. & PRESET 20 = 220. 000		VER /OP		

NOTE: THE TERM [freq sw.] MEANS DISPLAY READS THE SAME AS POSITIONS OF FREQUENCY SELECTORS.
THE TERM [blank] MEANS ALL SEGMENTS ARE NOT LIT.
THE TERM [CHAN] MEANS DISPLAY READS THE SAME AS PRESET NUMBER SELECTED BY PRESET SELECTOR.
THE SYMBOL ≠ MEANS "NOT EQUAL TO".
▩▩▩.▩▩▩ AND ▩▩ MEANS ALL SEGMENTS ARE LIT.
INFORMATION SHOWN IN STATUS COLUMNS WILL BE DISPLAYED FOR A MINIMUM OF 5 SECONDS AFTER PRESSING STATUS SWITCH.

MX-62-118-28
BLP040288

Figure 1-5. Radio Set Display Operation

CHAPTER 2

SPECIAL TOOLS AND TEST EQUIPMENT

2-1 GENERAL.

This chapter details the special tools and test equipment required to perform the intermediate level maintenance tasks in this manual.

2-2 STANDARD TEST EQUIPMENT.

The standard test equipment required to perform intermediate maintenance tasks are listed in table 2-2.

2-3 SPECIAL TOOLS AND TEST EQUIPMENT LIST.

The special tools and test equipment required to perform intermediate maintenance tasks are listed in table 2-3. The MX-9530/ARC test adapter is shown in figure 2-1. The Radio Test Set AN/ARM-173 is shown in figure 2-2 with major units listed in table 2-4. The Radio Test Set TS-3919/ARM-173 is shown in figure 2-3 with major units listed in table 2-5. Figure 2-4 shows the Test Adapter MX-10246/ARM-173.

2-4 ESD EQUIPMENT REQUIREMENTS.

Refer to TO 00-25-234 for the equipment required to comply with the ESD cautions in this manual. If necessary equivalent items may be used in place of the items listed in TO 00-25-234.

2-5 CONSUMABLES.

Expendable items and support materials for the Have Quick related equipment are listed in table 2-1.

Table 2-1. List of Consumables

Nomenclature	Specification	Part number	FSCM
Adhesive, (Type I)	MIL-A-46146	N/A	
Sealant, (Grade C)	MIL-S-22473	N/A	
Silicone Compound	MIL-C-47113	SWS 299	71984
		DC 340	
Thread Sealant		N/A	04866
Grease		FS-3451	71984
Silicone Compound	MIL-G-4343	DC #55 M	71984
		G 376	01139

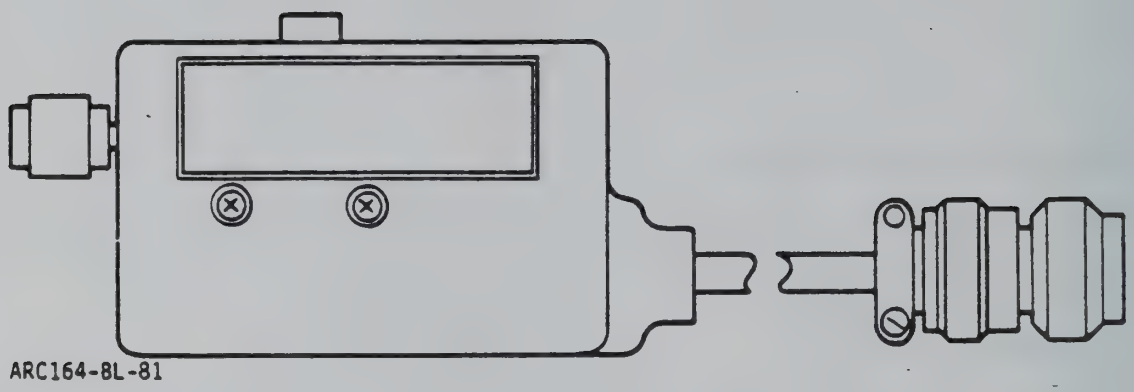


Figure 2-1. Test Adapter MX-9530/ARC

Table 2-2. Standard Test Equipment List

Type Designation	Alternate Type Designation	Figure Number	Nomenclature	Use
	Equivalent	5-1, 6-1	50 ohm dummy load, 20W	Attenuates RF output of RT.
HP-6267B	Equivalent	5-1, 6-1	Power supply, 0-40 Vdc.	Provides DC input power for test equipment and UUTs.
Edison 800-P3	Equivalent	6-1	6 dB coaxial attenuator	Provides 6 dB attenuation.
Fluke 8025A	Equivalent	5-1, 6-1	Multimeter	Used to measure resistance and voltages.
GR 1840A	Equivalent	6-1	Power meter	Used to measure audio signal levels.
HP-8640B	Equivalent	6-1	RF signal generator/ frequency counter	Provides RF signals for measuring receiver sensitivity, AGC, frequency response, and other functions of the RT during the MPT. Provides means for measuring frequency.

Table 2-3. Special Tools And Test Equipment List

Part number	Figure number	Nomenclature	Use
H-157/AIC	5-1, 6-1	Headset-microphone	Provides microphone and earphone for voice communication.
MX-9530/ARC	2-1, 5-1, 6-1	Test Adapter	Provides interfacing between headset-microphone and test equipment.
ID-1961B or ID-1961C	5-1, 6-1	Indicator	Provides visual readout of UUT operating frequency.
J-3407/ARM-173	2-2, 5-1, 6-1	Interface Junction Box	Provides interface between control unit, indicator, and test adapter.
KOI-18/TSEC		Tape Reader Fill Device	Used to load KYK-13 for use in minimum performance test.
KYK-13/TSEC		Keyfill Device	Used to load MWOD information into RT for minimum performance test.
MX-10246/ARM-173	2-4, 5-1, 6-1	Test Adapter	Provides interface between UUT and reference test unit.
C-11721/ARC-164	6-1	Radio Set Control	Test standard for use in MPT.
C-11816/ARC-164	6-1	Radio Set Control	Test standard for use in MPT.
RT-1504/ARC-164	5-1, 6-1	Remote Receiver-transmitter (RT)	Provides a test standard when testing a mounting base containing an RT.
Handset H-33 or H-138	5-1	Handset	Used to test audio connectors on C-11816.
CX-13026	2-2, 5-1, 6-1	Cable	Connects indicator to junction box.
CX-13005	2-2, 6-1	Cable	Connects C-11721 to junction box.

Table 2-3. Special Tools And Test Equipment List - CONT

Part number	Figure number	Nomenclature	Use
CX-13022	2-2, 5-1, 6-1	Cable	Connects junction box to test adapter.
MX P/N 565750-801	2-3, 6-1	Cable	Connects mounting base to test adapter.
MX P/N 565748-801	2-3, 5-1, 6-1	Cable	Connects test standard RT to test adapter.

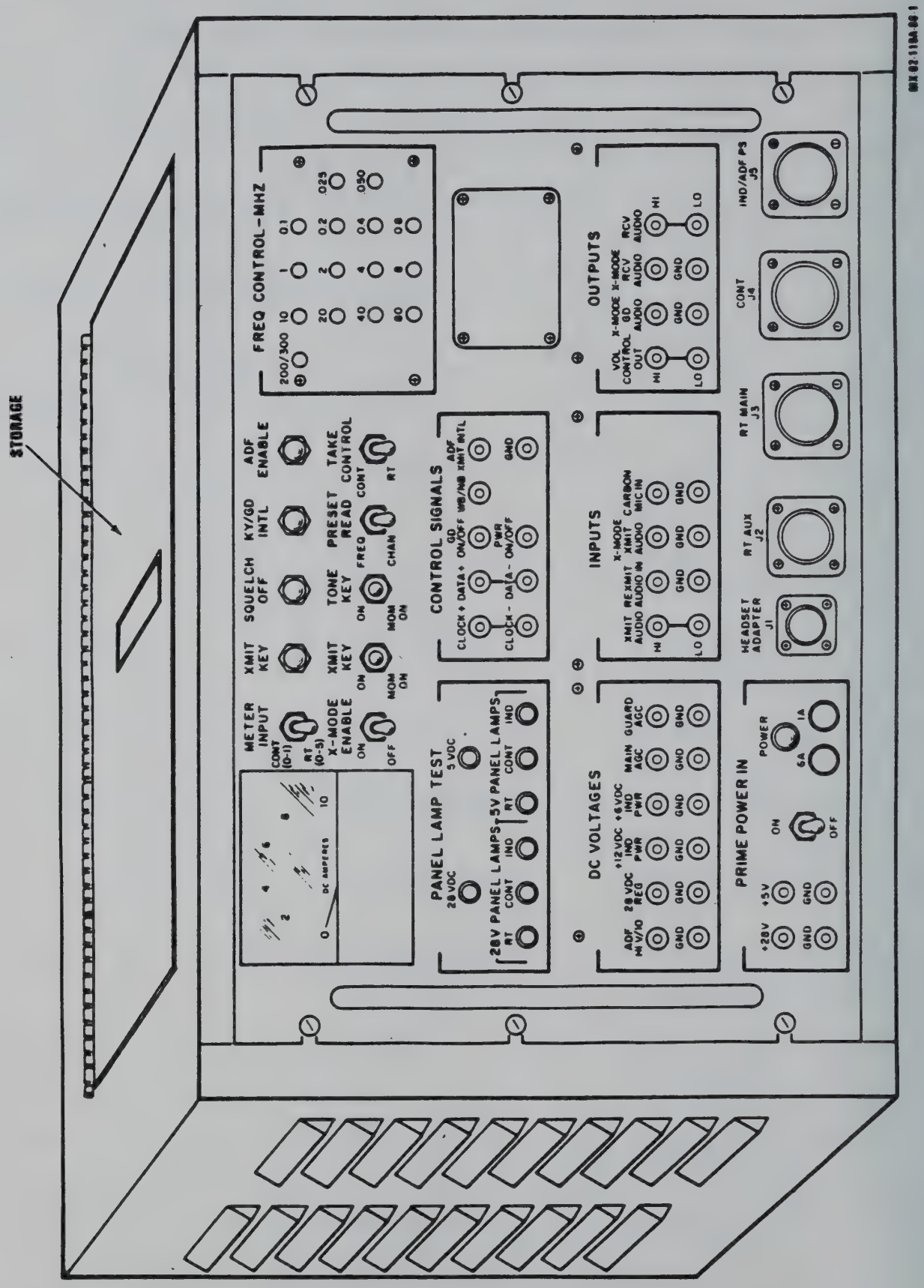


Figure 2-2. Radio Test Set AN/ARM-173 (Sheet 1 of 2)

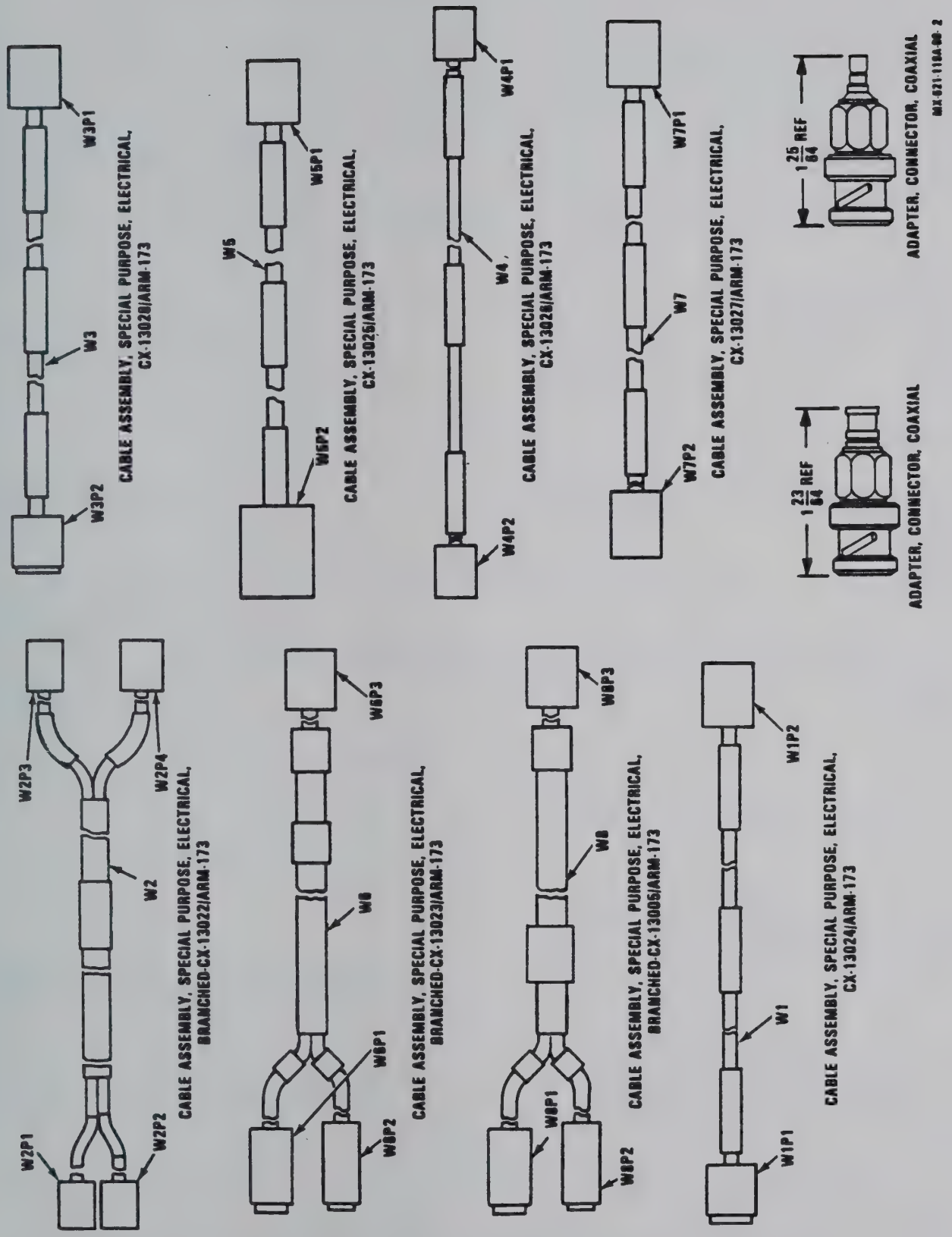


Figure 2-2. Radio Test Set AN/ARM-173 (Sheet 2 of 2)

Table 2-4. Radio Test Set AN/ARM-173 Major Units

Type designation	Nomenclature	Use
J-3407/ARM-173	Interface Junction Box	Provides equipment interconnections, test points, and signal switching.
CX-13024/ARM-173	Cable Assy., Special Purpose Electrical (S.P.E.)	Connects remote RT to J-3407 or to MX-10246 test adapter.
CX-13022/ARM-173	Cable Assy., S.P.E. Branched	Connects panel mount RT to J-3407, MX-10246 test adapter, or connects MX-10246 test adapter to J-3407.
CX-13026/ARM-173	Cable Assy., S.P.E.	Connects ID-1961B or ID-1961C to J-3407.
CX-13005/ARM-173	Cable Assy., S.P.E. Branched	Connects C-11721 to J-3407.
P/N 185732-1 (2 ea.)	Adapter, Submin RF/BNC	Allows connection to BNC type connectors and from subminiature rf connectors and cables on the bottom of RTs.
P/N 185732-2 (2 ea.)	Adapter, Submin RF/BNC	

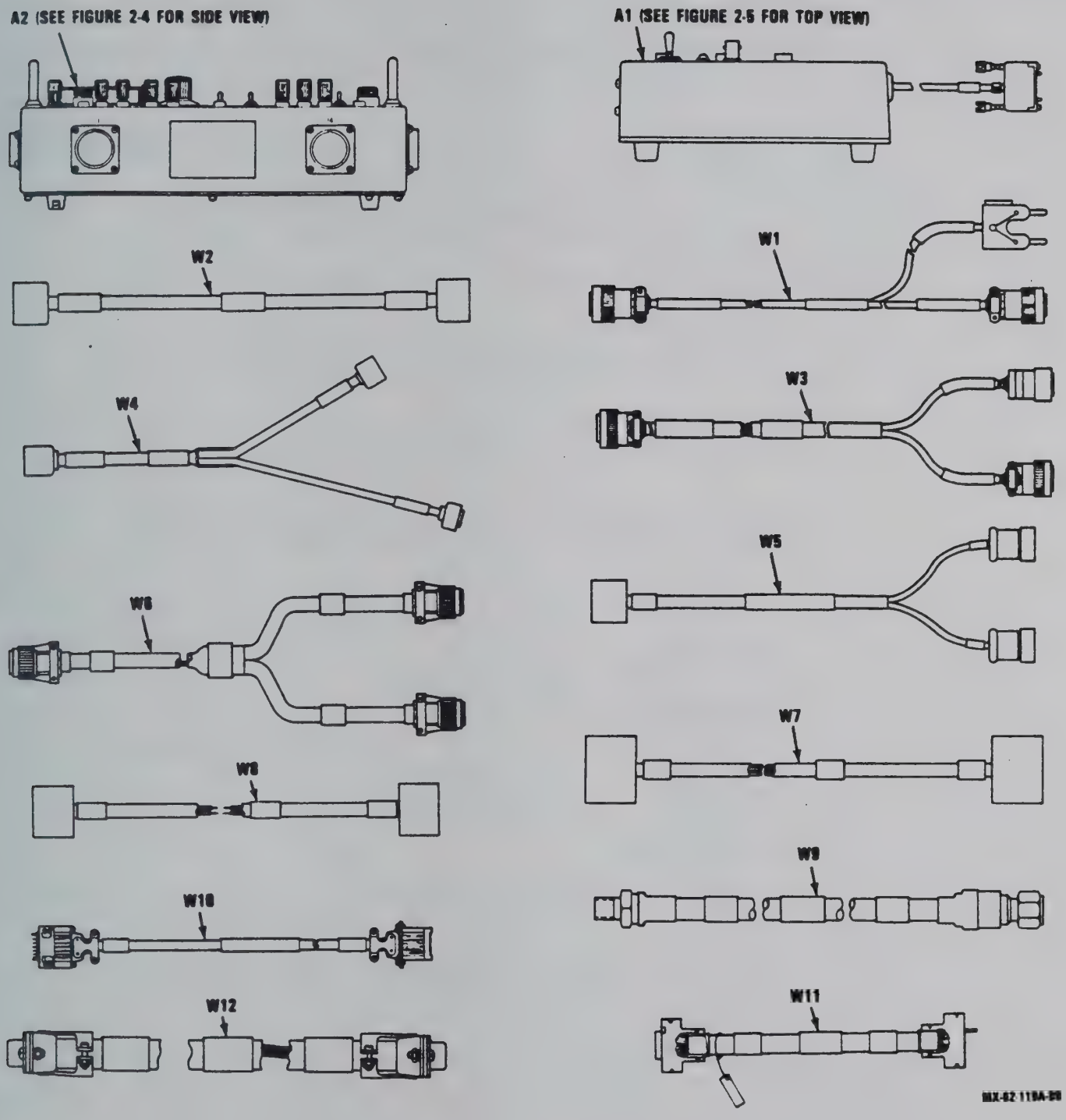


Figure 2-3. Radio Test Set TS-3919/ARM-173

Table 2-5. Radio Test Set TS-3919/ARM-173 Major Units

Ref des.	Part number	Nomenclature	Use
A2	810378-801	MX-10246/ARM-173 Test Adapter (MX-10246)	See figure 2-4. Provides junction box, switches and indicators to test the RTs and controls (in conjunction with the AN/ARM-173 Radio Test Set).
W4	565748-801	Cable Assembly (2 required)	Connects remote RT to test adapter.
W6	565750-801	Cable Assembly	Connects MT-6165 to test adapter.
W7	565751-801	Cable Assembly	Connects C-11816 to test adapter.

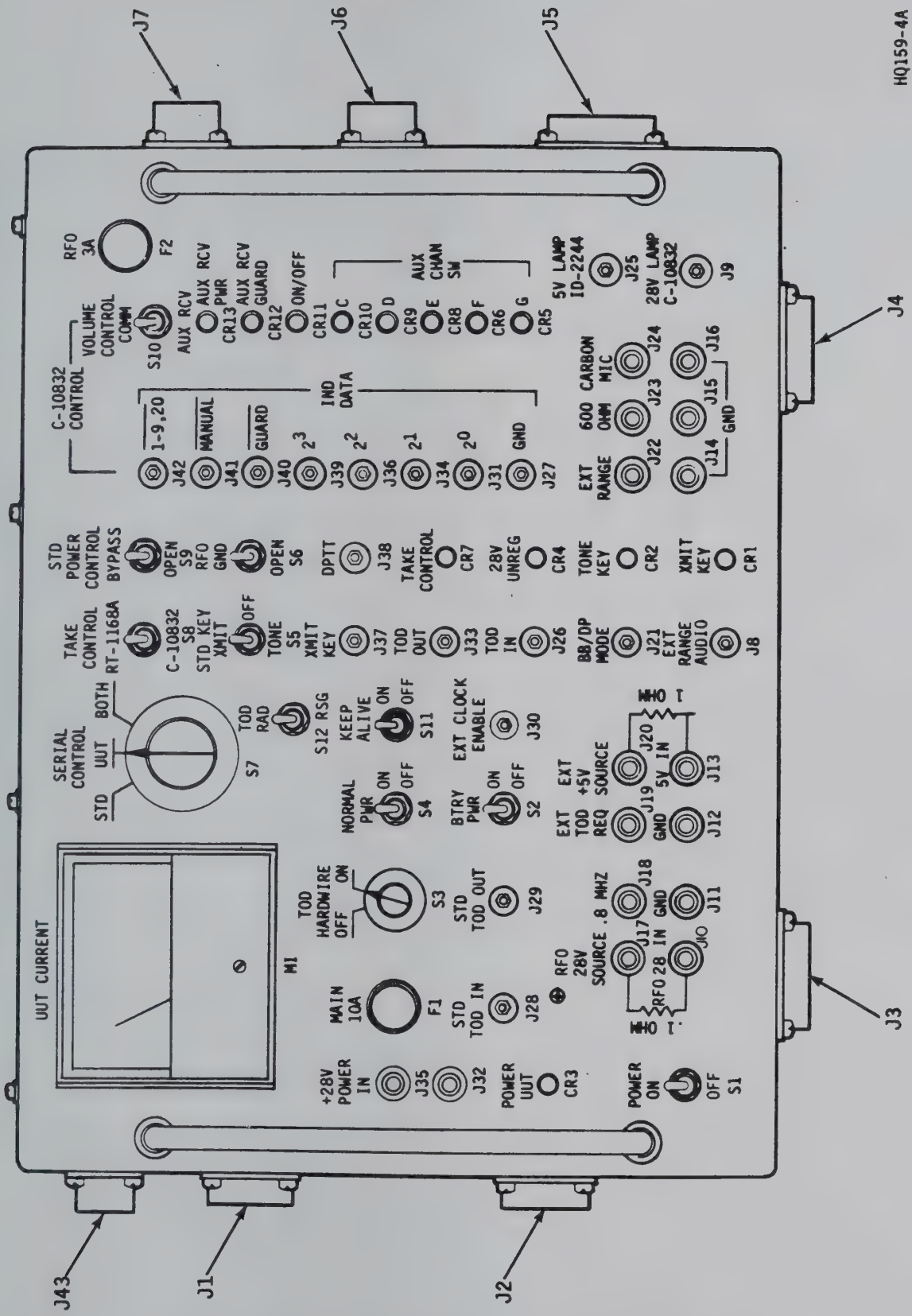


Figure 2-4. Test Adapter MX-10246/ARM-173

CHAPTER 3

THEORY OF OPERATION

3-1 GENERAL.

This chapter presents the theory of operation for the control unit C-11816 and the mounting base. Section I describes the functional operation of the control C-11816. Section II describes the functional operation of the mounting base MT-6165. Refer to TO 12R2-2ARC164-X2 for theory of operation of control unit C-11721 and RT-1504.

Section I. CONTROL UNIT C-11816 THEORY

3-2 FUNCTIONAL DESCRIPTION.

A block diagram of the control C-11816 is shown in figure 3-1. The control provides a means for remotely operating the RT in the mounting base. Switch settings on the switching unit panel assembly are interpreted by the front panel interface CCA which generates serial data and control signals. These signals are sent through W1J1 and external cabling to the mounting base. The LCD displays on the switching unit panel assembly are also controlled by the front panel interface CCA. Received audio from the mounting base is sent through the front panel interface CCA to the VOLUME control on the switching unit front panel. From the VOLUME control, the audio signal is sent back through the interface CCA to the audio connector interface CCA. The audio signal is then connected to the AUDIO 1 and AUDIO 2 jacks in the audio connector interface CCA. The received audio signal is also sent through the audio filter CCA to EXTERNAL SPEAKER jack W1J2. Filtered +28 Vdc is also sent out of W1J2 to power the external speaker. The LIGHTS/TOD SEND switch S1 applies +28 Vdc to the panel lamps in the switching unit panel assembly in the LIGHTS position and in the TOD SEND position sends +5 Vdc out of the control as a TOD REQUEST signal. The KEEP ALIVE switch S2 controls application of the external battery voltage and keep alive power. Connector W1J3 provides connection for hardwire TOD transfers. The power supply CCA converts the +28 Vdc input into +12 Vdc and +6 Vdc voltages. The +12 Vdc supplies components within the front panel interface CCA as well as being used to power the external indicator along with the +6 Vdc.

3-3 FRONT PANEL ASSEMBLY, A1.

The front panel assembly is comprised of the following subassemblies which are described in the following paragraphs:

a. Front panel interface CCA, A1A1
b. LCD modules, DS1 and DS2
c. Power supply CCA, A1A4
d. Audio connector interface CCA,A1A5
e. Switching unit panel assembly A1A6

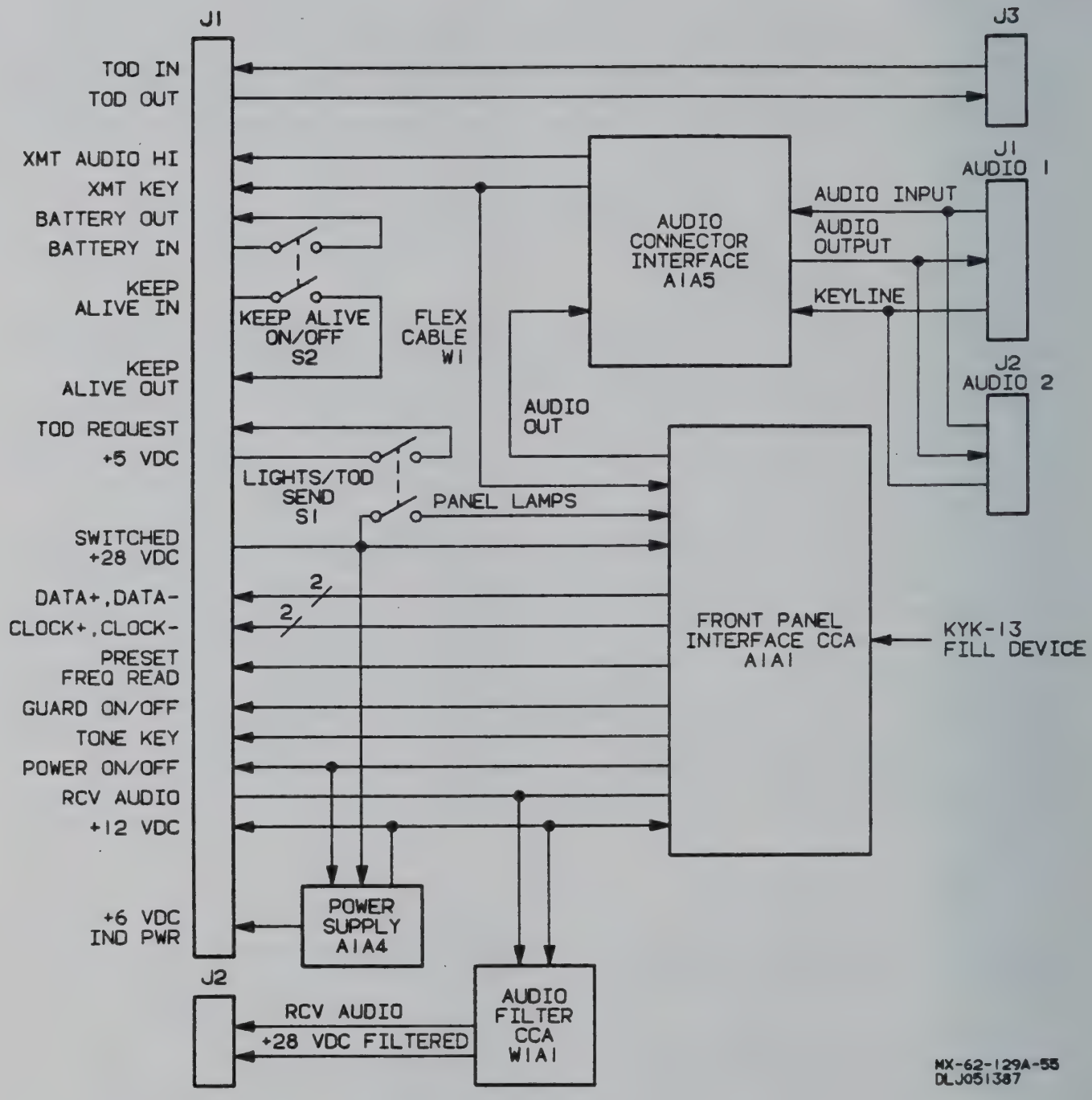


Figure 3-1. Control Unit C-11816 Block Diagram

3-3.1 Switching Unit Panel Assembly, A1A6. Figure FO-1 is a block diagram of the switching unit panel assembly. The actual wiring of the panel assembly is shown in the schematic diagram figure FO-11. Chapter 1 describes the function of each of the controls, switches, and indicators of the panel assembly. Switch outputs on the panel assembly connected to the 10-bit, 4-bit, or 8-bit data buses are monitored by the microprocessor in the interface assembly. Switches and controls which are not connected to one of the data buses are not monitored by the interface assembly, their outputs are routed directly through the interface assembly to the control flex cable and ultimatly to the RT. The 10-bit data bus input to the panel assembly is from the gate array in the interface assembly and is used to address the individual switch common contacts. The 10-bit data bus output of the panel assembly is connected in parallel to the switch contacts (1-10) of the respective switches. This data bus is used to monitor the position of each of the connected switches. The 8-bit data bus is used by the interface assembly to monitor the positions of the channel and function switches. The 4-bit data bus is used to monitor the positions of the squelch and preset switches as well as reading the data and fill present inputs from the KY device. The adjustments of the panel assembly are simple potentiometer circuits which are shown in more detail in the schematic diagram previously referenced. The remaining switches and controls are simple open/closed contact switches which are also shown in detail in the schematic diagram.

3-3.2 Front Panel Interface Assembly,A1A1. Figure FO-2 is a block diagram of the interface assembly. The interface assembly monitors switch positions on the panel assembly, controls the LCD displays, generates serial data and clock outputs, and provides individual control signals which are sent to the RT. The interface assembly contains an 8-bit microprocessor which executes an operating program stored in EPROM to perform the functions of switch position monitoring, serial data and clock generation, and LCD display control. The switching unit gate array serves as the primary input/output port for the microprocessor. The functions of the interface assembly can be roughly divided into LCD display control and serial data and control signal generation.

3-3.2.1 Serial Data/Control Signal Generation. The interface assembly generates serial data containing information corresponding to panel assembly switch positions. To develop the serial data, the interface assembly constantly monitors the positions of the switches. Monitoring of ten individual switches is accomplished by sending data on a 10-bit data bus which is connected to the common contacts of the individual switches. The actual switch position is then read on a 10-bit data bus connected to contacts 1-10 of the switches. Monitoring of other switches and the fill connector is accomplished by reading data on separate 8-bit and 4-bit data buses connected to contacts of the switches and fill connector pins. The 10-bit data bus connected to the switch commons carries a 10-bit data word generated by the microprocessor. Each data bit of the 10-bit word is connected to a specific switch common contact. The 10-bit data bus connected to the switch contacts carries a 10-bit word with each bit corresponding to a switch contact. The microprocessor monitors the switch positions by sending data words addressing each switch common and reading the switch contact data word during the same clock pulse. Following is an example of how the microprocessor reads switch positions corresponding to 323.375 MHz.

During clock 1, the microprocessor sends a data word to the switch commons as follows (selecting the 2-3-A switch common):

Logic	L	H	H	H	H	H	H	H	H	H
Switch	23A	10	1	.1	.025	ZERO	MPG	T-TONE	DT	ST

During the same clock, the microprocessor reads the data word connected to the 23A switch contacts as follows:

Logic	H	H	L	H	H	H	H	H	H	H
Contact	1	2	3	4	5	6	7	8	9	10

With the 2-3-A switch in the 3 position, the logic low is transferred from the 2-3-A switch common to contact 3 of the switch. Even though the switch contacts of all ten switches are connected in parallel, only one switch common is addressed during a single clock pulse, so the microprocessor knows which switch contacts it is reading. To continue the example, the following data words are sent and read by the microprocessor:

During clock 2, the microprocessor sends a data word to the switch commons as follows (selecting the 10's switch):

Logic	H	L	H	H	H	H	H	H	H	H
Switch	23A	10	1	.1	.025	ZERO	MPG	T-TONE	DT	ST

During the same clock, the microprocessor reads the data word connected to the 10's switch contacts as follows:

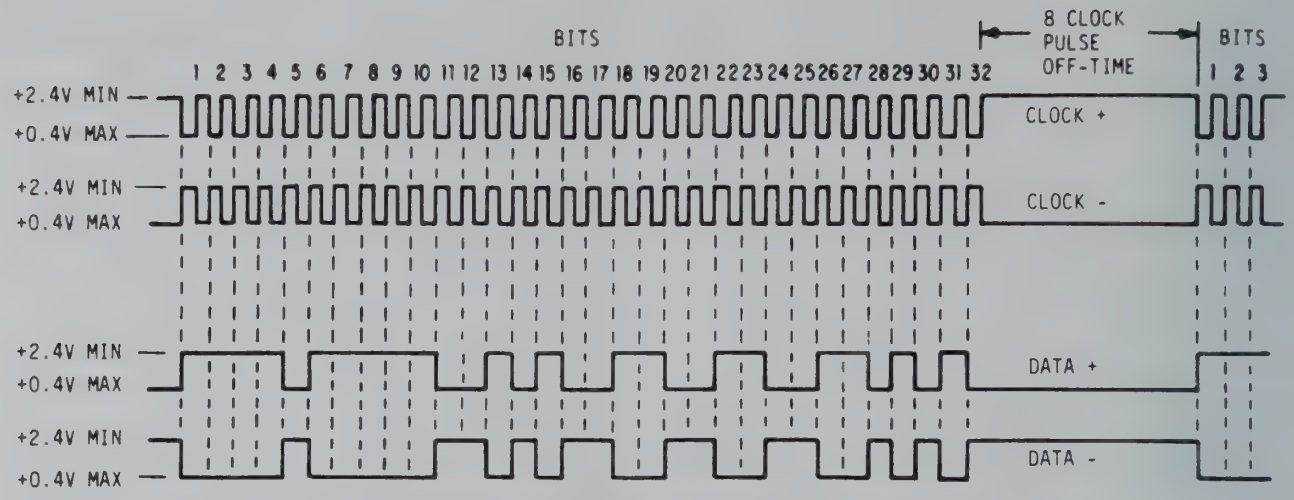
Logic	H	L	H	H	H	H	H	H	H	H
Contact	1	2	3	4	5	6	7	8	9	10

With the 10's switch in the 2 position the logic low on the switch common is transferred to contact 2 of the switch and is read by the microprocessor. This process continues for successive clock pulses until each switch common is addressed and the contacts of each switch are read. The 8-bit data bus and 4-bit data bus data words are also read during individual clock pulses. The data words of these buses contain logic low bits corresponding to the switch positions. (The ground connected to the commons is picked up through the closed switch contacts). The microprocessor formulates four 8-bit data words based on the cumulative positions of the monitored switches. The four data words are then converted into a 32-bit serial data word by the switching unit gate array. From the gate array the serial data is sent along with clock data to a line driver and ultimatly out of the interface assembly. The actual composition of the 32-bit word is detailed in table 3-1 and shown in figure 3-2. The 32-bit serial data is sent from the interface assembly to the ECCM control processor assembly which uses it to control RT operation. Individual control signals (fill request and tone key) are also generated by the microprocessor in response to switch positions read on the data buses. The microprocessor uses the RAM to temporarily store data and the EEPROM to store preset channel data. The microprocessor knows when to send frequency/mode data or word-of-day data in the serial data word based on the positions of the front panel switches.

3-3.2.2 LCD Displays, DS1 and DS2. The LCD displays are shown in figure FO-2. The interface assembly controls the actual LCD indications by generating serial data which contains information corresponding to switch positions on the panel assembly.

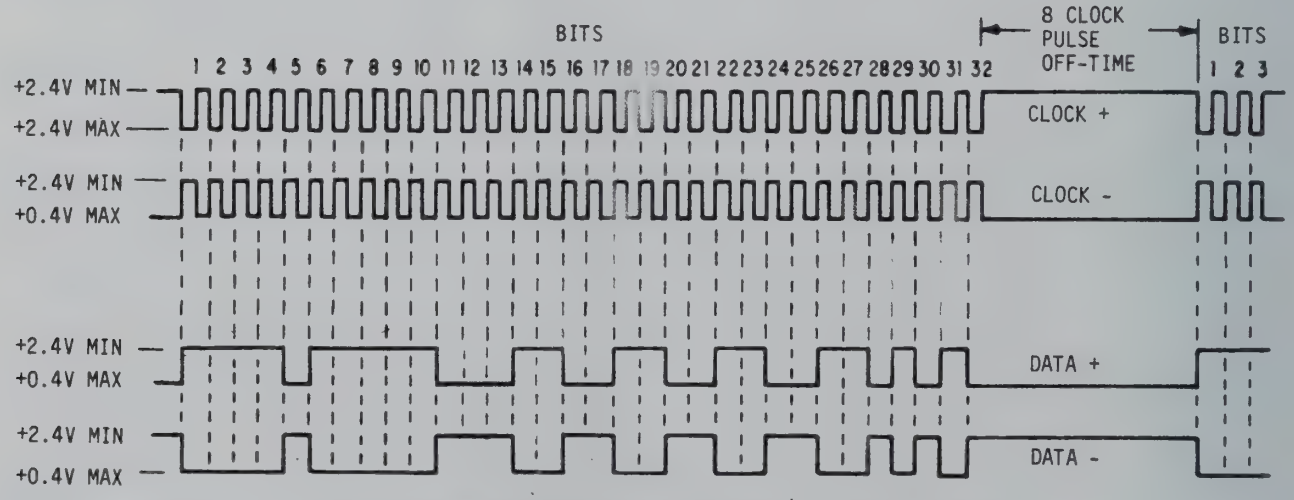
The serial data is developed in the gate array from an 8-bit data word from the microprocessor. The serial data, clock, load, and LCD display select data lines are connected from the gate array to decoders/drivers in the LCD modules. The decoders/drivers decode the serial data and activate the appropriate segments of the character displays to indicate the correct information. The LCD displays are illuminated by a back lighting bar which is controlled by the interface assembly. The channel LCD indicator contains a phototransistor whose voltage output varies with the detected light intensity. This voltage is sent to the interface assembly where it is applied to a select circuit. The interface assembly also monitors the voltage of the panel lights which is variable by external control. The microprocessor in the interface assembly alternately selects the phototransistor voltage and the panel lights voltage by a select logic signal from the gate array. The selected voltage is then converted to digital data by an analog to digital converter. The microprocessor reads the digital data through the gate array. Based on parameters contained in the operating program, the microprocessor generates an 8-bit data word which will adjust the back lighting to an optimum viewing level for the external lighting environment. The 8-bit back lighting word is converted to an analog voltage by a digital-to-analog converter and the resulting voltage is applied to a transistor which controls the resistance to ground of the current line from the back lighting bar. The lighting bar is connected to +5 Vdc, so varying the resistance of the ground path varies the intensity of the light produced by the bar. A power supply in the interface assembly supplies the LCD displays with +5 Vdc and -20 Vdc operating voltages.

3-3.2.3 Switching Unit Gate Array. Figure FO-3 is a block diagram of the switching unit gate array. The gate array provides various input/output ports for the 8-bit microprocessor. The input ports interface the 10-bit, 4-bit, and 8-bit data buses from the panel assembly. The 10-bit data bus words containing switch position information are converted from decimal to binary values by a decimal-to-binary encoder and are applied to a data latch along with the 4-bit data bus. The 8-bit data bus is applied directly to a data latch. The microprocessor reads the output of the data latches by sending a 4-bit data word to a binary to decimal decoder which converts the binary data to separate latch enable control signals. One of the output ports is used to send 10-bit data words to the switch commons in the panel assembly and to send individual control signals to the control flex cable. The microprocessor sends an 8-bit data word to this output data latch. Four of the bits contain binary switch common address information, the other four bits contain control signal information. The four switch common data bits are applied to a binary-to-decimal decoder which converts the binary data to a 10-bit data word which is sent to the panel assembly. Two of the remaining four bits are discrete outputs at the present time. The other two bits (fill request and tone key) are sent directly from the data latch to drivers in the interface assembly. A second output port is used to send a 5-bit data word to the LCD displays and a single bit to the voltage select circuit in the interface assembly. The final output port is used to generate a 32-bit serial data word and clock. The microprocessor sends four 8-bit data words to the four output data latches which are always enabled. The outputs of the data latches are applied to four serial shift registers which convert the parallel 8-bit data words into serial 8-bit data words. The outputs of the serial shift registers are cascaded to combine the four serial 8-bit data words into a single 32-bit serial data word. The 32-bit data word along with a clock are sent out of the gate array to line driver circuitry in the interface assembly.



NOTES:
1. DATA BITS CHANGE ON NEGATIVE-GOING EDGES OF CLOCK + OUTPUT.
2. BIT 1 IS FIRST BIT OUT OF REGISTER.
3. CLOCK FREQUENCY = 620 HZ ±20%.
4. CONDITIONS DESCRIBED BY DATA BITS ABOVE:
   (A) MANUAL MODE
   (B) PRESET CHANNEL SELECT SWITCH AT 5
   (C) MANUAL OPERATING FREQUENCY SELECTED - 299.975 MHZ
   (D) NB-WB SWITCH IN NB (BIT 29 HIGH, LOGIC 1)
   (E) SQUELCH ON-OFF SWITCH IN OFF (BIT 30 LOW, LOGIC 0)

(a) Normal Mode



NOTES:
1. DATA BITS CHANGE ON NEGATIVE-GOING EDGES OF CLOCK + OUTPUT.
2. BIT 1 IS FIRST BIT OUT OF REGISTER.
3. CLOCK FREQUENCY = 620 HZ ±20%.
4. CONDITIONS DESCRIBED BY DATA BITS ABOVE:
   (A) AJ MODE (BITS 12 AND 13 BOTH LOW, LOGIC 0)
   (B) PRESET CHANNEL SELECT SWITCH AT 5
   (C) MANUAL FREQUENCY SELECTOR SWITCHES AT A99.975
   (D) A SELECTED (BIT 29 HIGH, LOGIC 1)
   (E) SQUELCH ON-OFF SWITCH IN OFF (BIT 30 LOW, LOGIC 0)

(b) ECCM Mode

MX-62-119-28

Figure 3-2. Sample Serial Data Bit Timing Diagram

Table 3-1. Serial Data Bit Functions

Bit Number	Function
1	Chan Sel. 1 - 0 for Chan. 1 or 11
2	Chan Sel. 2 - 0 for Chan. 2 or 12
3	Chan Sel. 3 - 0 for Chan. 3 or 13
4	Chan Sel. 4 - 0 for Chan. 4 or 14
5	Chan Sel. 5 - 0 for Chan. 5 or 15
6	Chan Sel. 6 - 0 for Chan. 6 or 16
7	Chan Sel. 7 - 0 for Chan. 7 or 17
8	Chan Sel. 8 - 0 for Chan. 8 or 18
9	Chan Sel. 9 - 0 for Chan. 9 or 19
10	Chan Sel. 10 - 0 for Chan. 10 or 20
11	Chan Sel. 11 - 0 for Chan. 1-9 and 20 - 1 for Chan. 10-19
12	M-P-G/A-T - 0 for Manual (Normal Mode) or A/T (AJ Mode) - 1 for Preset and Guard (Normal Mode)
13	M-P-G/A-T - 0 for Guard (Normal Mode) or A/T (AJ Mode) - 1 for Manual and Preset (Normal Mode)
14	200/300 - 0 = 200 - 1 = 300
15	10 MHz - Positive Logic BCD
16	20 MHz - Positive Logic BCD
17	40 MHz - Positive Logic BCD
18	80 MHz - Positive Logic BCD
19	1 MHz - Positive Logic BCD
20	2 MHz - Positive Logic BCD
21	4 MHz - Positive Logic BCD
22	8 MHz - Positive Logic BCD
23	0.1 MHz - Positive Logic BCD
24	0.2 MHz - Positive Logic BCD
25	0.4 MHz - Positive Logic BCD
26	0.8 MHz - Positive Logic BCD
27	.05 MHz - 1 = .05 MHz
28	.025 MHz - 0 = .025 MHz
29	WB/NB-A/T - 0 = WB, T - 1 = NB, A
30	Squelch Disable - 0 = Disable
31	Spare - Always Logic 1
32	Spare - Always Logic 0

3-4 POWER SUPPLY, A1A4.

The power supply CCA is shown in figure 3-3. The power supply circuit card assembly converts the +28 Vdc input power to the control unit into +12 Vdc and +6.2 Vdc voltages. The +6.2 Vdc is sent from the control unit to power an external frequency indicator. The +12 Vdc is sent to the external indicator and to the front panel interface assembly.

3-4.1 +12 VDC. +28 Vdc is applied to reverse polarity protection diode CR1 and a low-pass filter consisting of L1 and C3. Zener diode VR2 is used as a 90 volt spike suppressor. The DC input voltage is applied through R5 to the voltage regulator U1. The input voltage to the regulator is limited to less than 33 volts by zener diode VR1. The power ON/OFF control line is tied through isolation diode CR2 to the voltage regulator on/off input. The reference voltage (+12 to +14 Vdc) for the voltage regulator is set by variable resistor R18. The voltage regulator controls the output voltage by varying the bias voltage applied to the base of series pass transistor Q7. Current limiting is accomplished by current sensing resistor R21 and Q8. As the output current varies, the voltage drop across R21 varies and the voltage regulator adjusts the bias voltage to Q7 accordingly. The +12 Vdc output is sent through reverse input protection diode CR15 and out of the power supply. The +12 Vdc is also sent to the +6.3 Vdc circuit.

3-4.2 +6.3 Vdc. The +6.3 Vdc circuit uses pulse width modulation of the +12 Vdc to develop the +6.3 Vdc output. Switching transistors Q5 and Q6 with transformer T1 and transitor drivers Q3 an Q4 form a pulse width modulator or DC chopper. The +12 Vdc from R21 is applied to the emitters of Q5 and Q6. Because two transistors do not have the exact same characteristics, one transistor starts to conduct before the other, and oscillation occurs. The output of Q6 and Q5 is approximately a 24 volt peak-to-peak squarewave at 12 kHz. Feedback windings of T1 are used for two purposes. First, it provides a pulsed output to the collectors of Q1 and Q2. Second, it is applied to diodes CR3 and CR4 which develop approximately +20 Vdc. This voltage is used to bootstrap the input of the regulator U1 when the +28 Vdc input supply voltage decreases. Transistors Q1 and Q2 provide timing control for the main oscillator (via RC network C1, R2, and R3) and also provide the means for running the inverter without saturating the core of T1. Without the addition of Q1, Q2 and associated components, the inverter would run at approximately 10 kHz. The chopped DC output from T1 is rectified by CR10 and CR11 and sent through a low pass filter consisting of L2 and C9. The 6.3 Vdc output is sent out of the control to the external indicator.

3-5 AUDIO CONNECTOR INTERFACE CCA, A1A5.

The audio connector interface CCA is shown in the control C-11816 wiring harness schematic diagram, figure FO-10. The audio connector interface CCA provides two separate audio output ports for connection of external handsets. The audio signal from the interface CCA is routed through pin D of J3 and out pin A of J1 (AUDIO 1) and J2 (AUDIO 2). The audio from the external headsets is input at pin C of J1 and J2 and output from the audio interface CCA at J3-G. The transmit key line from the headsets is input at J1-F and J2-F and is output from the audio connector CCA at J3-M. The remaining components provide impedence matching for the external headsets.

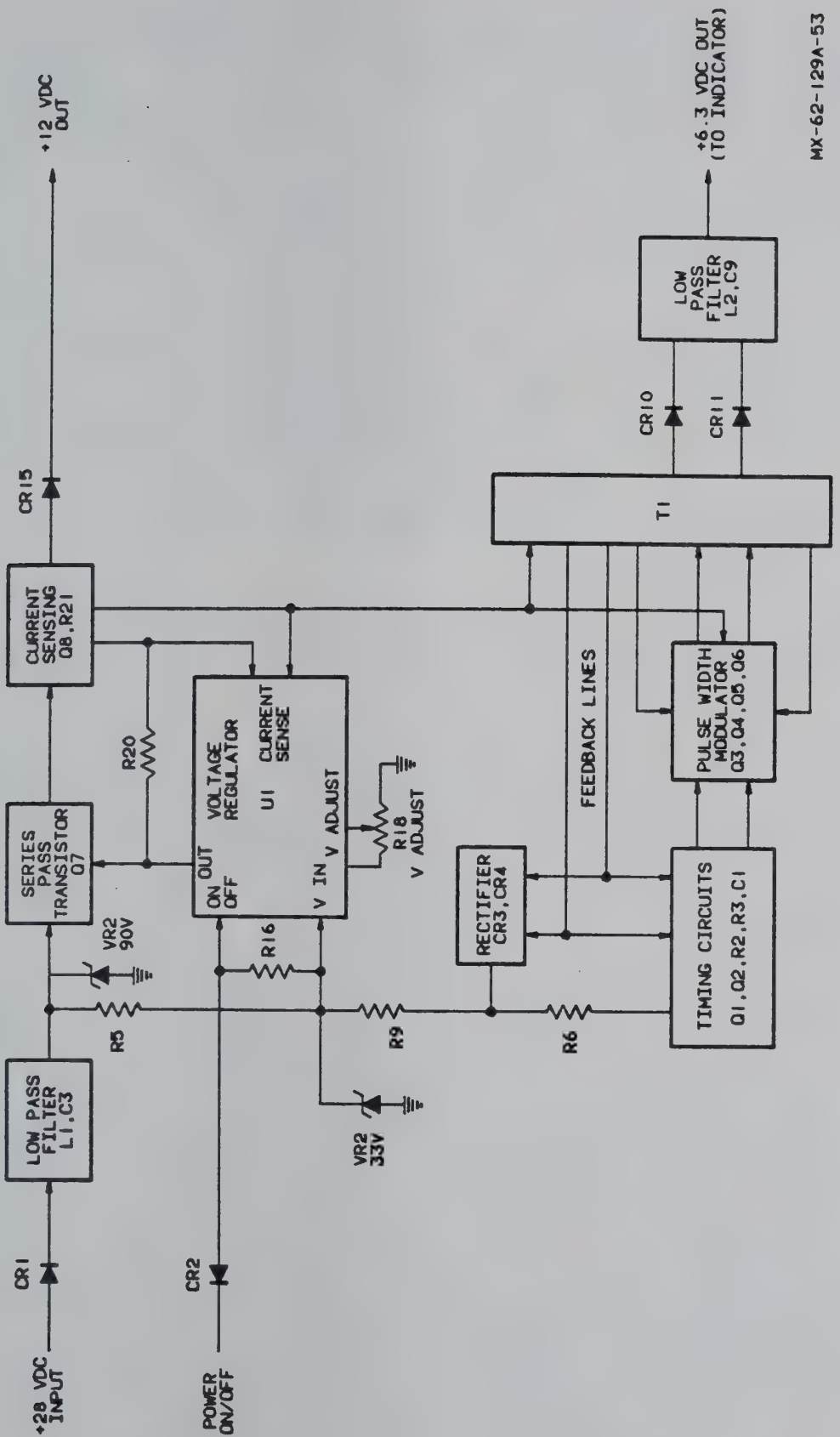


Figure 3-3. Power Supply CCA Block Diagram

Section II. MOUNTING BASE MT-6165 THEORY

3-6 FUNCTIONAL DESCRIPTION.

Figure 3-4 is a functional block diagram of the MT-6165 mount. Figure FO-15 is a schematic diagram of the MT-6165 mount. The MT-6165 mount contains five SRU's and connections for mounting a remote RT. The SRU's consist of Rubidium Oscillator, Y1; Divider/Audio circuit card assembly, A2; Power Supply, PS1; DC/DC Converter, PS2; and Battery, BT1.

3-6.1 Rubidium Oscillator, Y1. Operating voltage for the precision rubidium oscillator is 27.5 Vdc from the DC/DC Converter, PS2. The oscillator requires approximately 10 minutes from cold start to reach operating temperature. Until an internal thermistor indicates operating temperature is reached, operation from the 18 Vdc battery is prevented. The oscillator output is 10 MHz, applied to the Divider/Audio board A2.

3-6.2 Power Supply, PS1. The power supply converts the +27.5 Vdc input voltage from the DC/DC converter into +6.2 Vdc and +12 Vdc. These voltages are sent to power the divider/audio board.

3-6.3 DC/DC Converter, PS2. The input to the DC/DC Converter is +18 to +32 Vdc from an external source or from the internal +18 Volt Battery, BT1. The DC/DC converter outputs +27.5 Vdc to the rubidium oscillator, Y1, and power supply, PS1.

3-6.4 Battery, BT1. The +18 Volt battery provides operating voltage to the DC/DC converter to maintain the oscillator frequency during changeover between system power sources. During normal operation the battery is charged through a regulator on the divider/audio board. External power must be supplied to the system initially to actuate a relay on the divider/audio board before the battery will pick up the load. KEEP ALIVE switch, S1, set to ON, connects the battery to the divider/audio board. Switch S1 should be set to OFF when the system is not operating to prevent battery discharge.

3-6.5 Divider/Audio Board,A1. A block diagram of the divider/audio board is shown in figure FO-4. The divider/audio board circuits provide frequency interface and monitoring between the oscillator and the radio, battery charging and power connection for the DC/DC converter, audio amplification, and voltage regulation.

3-6.5.1 800 KHZ Frequency Interface/Monitoring. The 10 MHz from the rubidium oscillator is input to the divider/audio board at connector J2. Capacitor C12 couples the input to transistors Q3 and Q4 which convert the 10 MHz sinewave to a 10 MHz squarewave. The 10 MHz squarewave is applied to divide-by 1.25 divider counter U5. The 4 MHz output of U5 is fed to divide-by 5 divider counter U9. The resultant 800 kHz output frequency from U9 is sent through line driver U8 out of the divider/audio board to the RT. The 800 kHz signal is also sent to the 800 kHz monitor circuit which checks for frequency accuracy. From inverter U6, the 800 kHz is applied to frequency detector U11. U11 checks for over-frequency or under-frequency of the 800 kHz by comparing the period of the 800 kHz to upper and lower period limits. If the frequency is too high or too low, the output of U11 (or U12)

goes low. This low is applied to a logic circuit consisting of U7, U13, and U10. When the frequency is out of limits, the output of the logic circuit is high for 20 ms minimum. This high causes transistor Q5 to turn on and the monitor signal to the RT to go low, indicating to the RT that the 800 kHz is not usable. The RT then switches to its internal clock for timing.

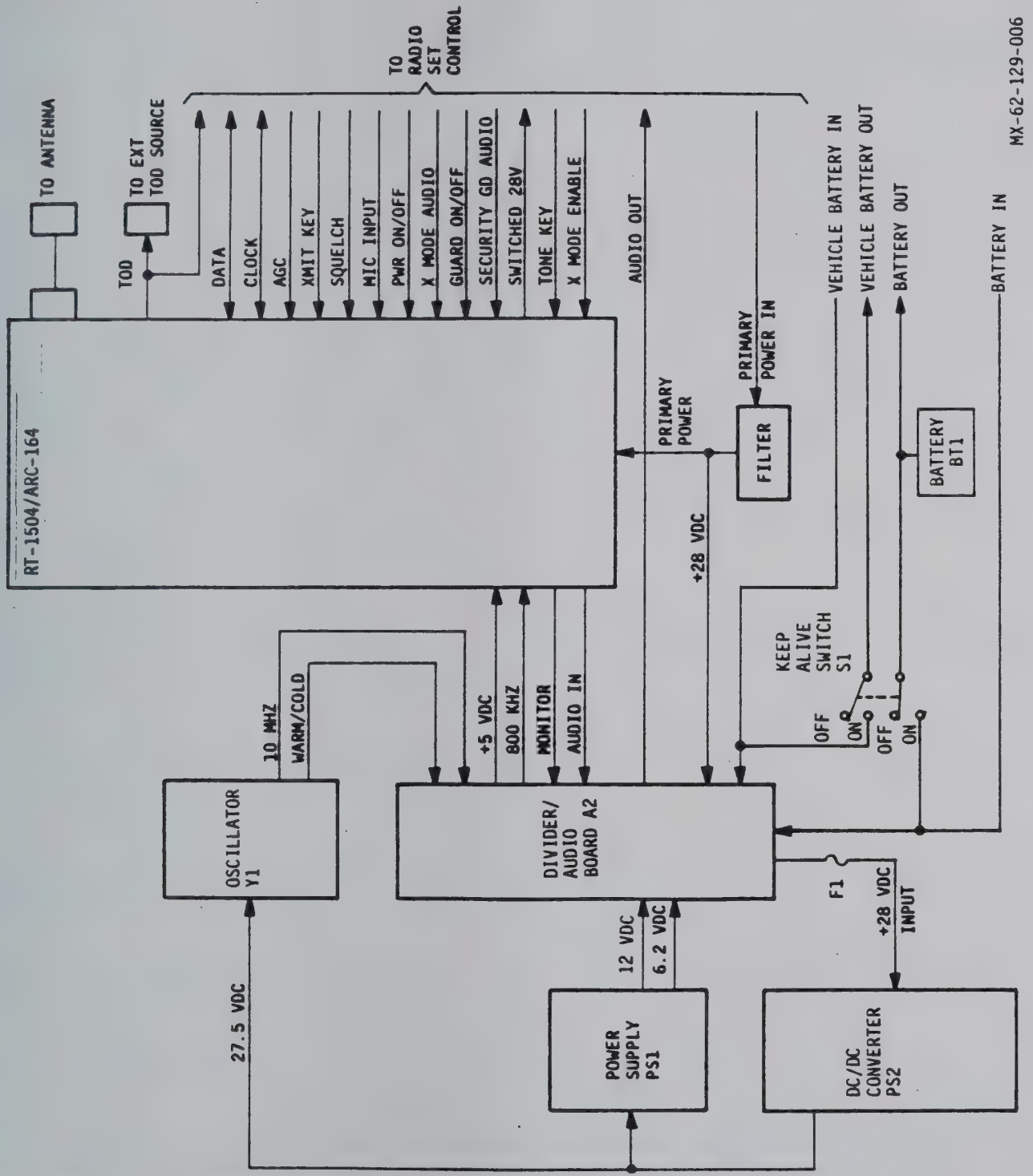


Figure 3-4. Mounting Base MT-6165 Block Diagram

3-6.5.2 Voltage Divider/Battery Charger. The primary power (+27.5 Vdc) enters the divider/audio board and is applied to voltage regulator U1. Resistor R4 is set to provide +22.5 Vdc out from the regulator. This voltage is used by U4 as well as being applied to two separate voltage dividers. Resistors R6, R7, and R8 form a voltage divider which drops the +22.5 Vdc to +19.5 Vdc. Diodes CR5 and CR6 provide current limiting for the battery charging line. The +19.5 Vdc is sent through CR9 and out of the divider audio board to charge the internal battery. Power supply PS1 supplies the divider/audio board with +12 Vdc and +6.2 Vdc. The +12 Vdc is filtered by C1 and R34 before being used to power components of the divider/audio board. The +6.2 Vdc is dropped across CR2 resulting in +5 Vdc which is filtered before being sent out of the divider/audio board to the RT. The +6.2 Vdc input is also dropped across CR1 resulting in +5 Vdc for use by the divider/audio board components. External jeep battery voltage or external +28 Vdc lines are routed through the divider/audio board and are output as controlled +28 Vdc to the DC/DC converter PS2.

3-6.5.3 Battery Anti-Deep Discharge Circuit. The battery anti-deep discharge circuit is comprised of K1, Q1, Q2, U2, and U3. The primary power +27.5 Vdc input is applied to a voltage divider consisting of R2, R3, and VR1. VR1 zener diode regulates the output of the voltage divider to +5.1 Vdc. This voltage is read by U2, indicating that the primary power input is present. The internal battery is not used while the primary power input is present. The other input to U2 is from the WARM/COLD temperature monitor in the rubidium oscillator. When the oscillator is cold this signal is high, after it warms up, this signal is low. The internal battery voltage is not used until the oscillator warms-up because when cold, the oscillator draws enough current to cause the battery to deep-discharge. The output of U2 is high only when the primary power input is present and the oscillator is cold, all other input conditions to U2 cause a low output from U2. Assuming the output of U2 is high, Q2 turns on causing the + input of U3 to go low and the output of U3 to go low. This low turns off Q1 which de-energizes K1. This takes the internal battery out of the circuit and the primary power input through diode CR3 is applied to the DC/DC converter input line. In all other input conditions of U2, the output of U2 is low, which turns Q2 off. The + input to U3 is then fed by the primary power or jeep battery voltage on the DC/DC converter line. With the voltage on U3 + greater than the voltage on U3 - input, the output of U3 is high. The high output of U3 turns on Q1 which energizes K1. This places the internal battery voltage on CR7. If either the primary power (+27.5 VDC) or the jeep battery voltage (+24 Vdc) is present on the DC/DC converter line, CR7 is reverse biased and the battery voltage is not used. If both of these voltages are missing, CR7 is forward biased and the internal battery voltage is sent to the DC/DC converter. If the internal battery voltage drops below 1.5 volts per cell, the + input to U3 becomes less than the - input and the output of U3 goes low. This de-energizes K1 and disconnects the battery from the circuit, preventing deep-discharge of the battery.

3-6.5.4 Audio Amplification. The incoming audio signal enters the divider/audio board and is applied to operational amplifier U4 through coupling capacitor C6. R14, R15, and R16 provide impedence matching and attenuation of the input line. The audio signal is processed through U4 and output through coupling capacitor C11. The audio output is approximately equal to the audio input level.

3-6.5.5 Voltage Regulation. The +6.2 Vdc from the power supply is filtered and regulated to +5 Vdc for use in the on-board circuits and for application to the radio. The +12 Vdc is filtered and used as operating voltage in board circuits.

CHAPTER 4

DESCRIPTION OF SYSTEM TIE-IN OF EQUIPMENT AND ACCESSORIES

4-1 GENERAL.

This chapter describes the interconnection of the radio sets with other equipments. The radio sets are designed to replace existing radio sets and to interact with the host equipment using existing interconnections.

4-2 RADIO SET AN/URC-98.

Figure FO-5 shows the system interconnection of a typical radio set AN/URC-98 installation. The radio set AN/URC-98 is a direct replacement for the AN/ARC-51BX radio set in the AN/MRC-107A Communications central. Replacement consists of the following:

a. Have Quick II Radio Set Control C-11721 replaces either the Radio Set Control C-10904/URC-98 (original Have Quick) or the Radio Set Control C-6476 (non Have Quick) in the UHF remote control panel.

b. Electrical equipment mounting base MT-6165/URC containing RT-1504/ARC-164 replaces UHF Transceiver RT-742/ARC-51BX and Mount MT-2652/ARC.

c. Electrical connection is unchanged except for the keep-alive power cable.

4-3 RADIO SET AN/URC-99.

Figure FO-6 shows the system interconnection of a typical radio set AN/URC-99 installation. The radio set AN/URC-99 is a direct replacement for the AN/ARC-51BX radio set in the AN/MRC-108 Communications Central. Replacement consists of the following:

a. Have Quick II Radio set control C-11816 replaces either the Radio Set Control C-10905/URC-99 (original Have Quick) or the UHF Radio Set Control 313V-4 (non Have Quick).

b. Electrical equipment mounting base MT-6165/URC containing an RT-1504/ARC-164 replaces UHF Transceiver RT-742/ARC-51BX and Mount MT-2652/ARC. These units are part of the VHF/UHF Radio Receiver-Transmitter Group 718M-2.

c. Electrical connections remain unchanged except for the replacement of the existing antenna coaxial cable with a longer cable and the addition of the keep-alive power cable.

4-4 PHYSICAL DIMENSIONS.

The physical dimensions of the control C-11816 are shown in figure FO-7. The physical dimensions of the mounting adapter are shown in figure FO-8. Refer to TO 12R2-2ARC164-X2 for outline dimensions of the control C-11721 and the RT-1504.

CHAPTER 5

MAINTENANCE OF CONTROL C-11816

5-1 GENERAL.

This chapter contains the intermediate level maintenance information for the control C-11816. This chapter is divided into sections, with each section covering one of the maintenance tasks as follows:

Section I Minimum Performance Test
Section II Troubleshooting
Section III Repair Instructions

5-2 MAINTENANCE LEVEL.

The intermediate maintenance level consists of testing the control, identifying failed functions, isolating the failed function to an SRU, and removing and replacing the failed SRU.

Section I. MINIMUM PERFORMANCE TEST

5-3 TEST DESCRIPTION.

The minimum performance test for the control C-11816 is detailed in table 5-1. This test checks the functions of the control and establishes the minimum acceptable performance criteria. If a normal indication is not obtained during the performance of the test, proceed to the troubleshooting flow diagram step listed under the corrective action column for the failed step. Figure 5-1 illustrates the test equipment necessary and the setup of the equipment for the test. Refer to chapter 2 for information on the special and standard test equipment.

NOTE

The complete test procedure may be performed to determine the serviceability of a control unit, however, it is not necessary to perform the entire test procedure when verifying reported failures. Performing the steps which relate to the reported fault is sufficient. The entire minimum performance test should be performed on each control unit that is disassembled for troubleshooting or repair to ensure that the original problem is corrected and that no additional faults were induced during the maintenance action.

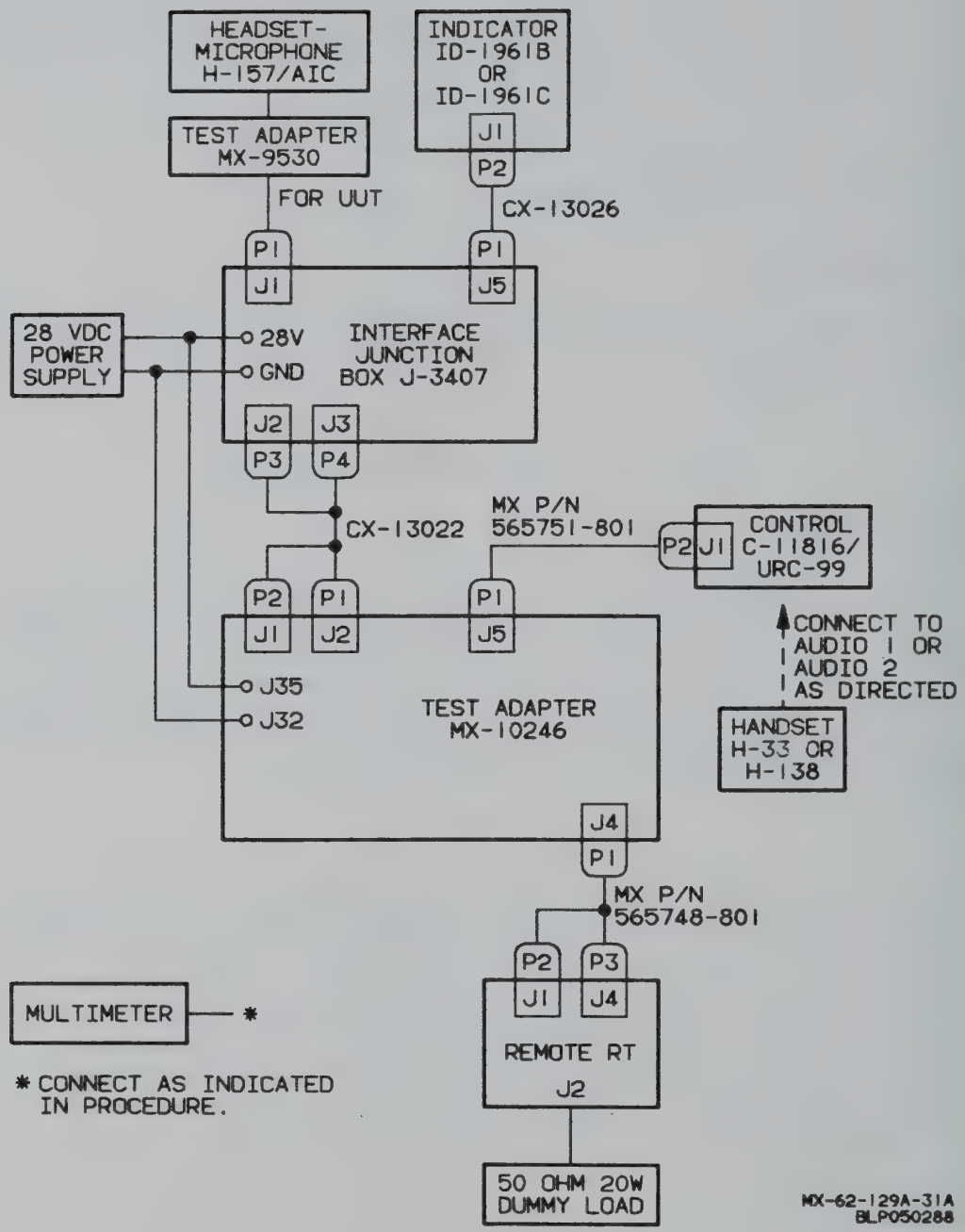


Figure 5-1. Control C-11816 Test Setup

Table 5-1. Control C-11816 Minimum Performance Test

Step	Procedure	Normal Indication	Corrective Action
1.	Connect equipment as shown in figure 5-1. Adjust input power to +28 ±0.5 Vdc.		
2.	On the MX-10246/ARM-173 Test Adapter (test adapter), set the following switches to the positions indicated. Switch — Position POWER (S1) — OFF BTRY PWR (S2) — OFF TOD HARDWIRE (S3) — OFF NORM PWR (S4) — ON STD KEY (S5) — OFF (mid) RFO (S6) — OPEN SERIAL CONTROL (S7) — BOTH TAKE CONTROL (S8) — RT-1168A STD POWER CONTROL (S9) — OPEN VOLUME CONTROL (S10) — COMM KEEP ALIVE (S11) — OFF TOD (S12) — EITHER		
3.	On the J-3407/ARM-173 Interface Junction Box (test set), set the following switches to the positions indicated. Switch — Position PRIME POWER ON/OFF — OFF X-MODE ENABLE — OFF XMIT KEY — Mid (off) TONE KEY — Mid (off) PRESET READ — CHAN TAKE CONTROL — CONT METER INPUT — CONT		
4.	On the control unit, set the following switches to the positions indicated. Switch — Position Function switch — OFF VOL (volume) — Fully ccw SQUELCH — ON M-P-G — MANUAL		

Table 5-1. Control C-11816 Minimum Performance Test - CONT

Step	Procedure	Normal Indication	Corrective Action
5.	Turn on the equipment in the following sequence: (1) test adapter (2) test set.		
6.	Set the control unit Function switch to the MAIN position.	All segments of f/s and CHAN indicators light momentarily; then display selected channel and frequency. ID-1961() displays the selected channel.	FO-9, step 1
7.	Press TEST DISPLAY switch.	All segments of both displays are lit.	FO-9, step 11
8.	On the control, set the LIGHTS/TOD SEND switch to LIGHTS.	Panel lamps light (red).	FO-9, step 16
9.	Block out light from the CHAN indicator.	When light is blocked out from the CHAN indicator, back lighting for the f/s indicator intensifies.	FO-9, step 17
10.	Rotate all five frequency switches through each switch setting, except for the 2-3-A switch, which should only be set to 2 and 3.	ID-1961 and f/s display show same frequency as frequency switches.	FO-9, step 10
11.	Set the M-P-G switch to PRESET. If the frequencies loaded into each preset memory location are known, proceed to the next step. Otherwise, perform the following steps to load preset channels 1-19.		
	a. Use the frequency switches to select the desired frequency.		
	b. Rotate the CHAN switch to the desired channel number. Do not use channel 20, as it is reserved for MWOD mode data.		
	c. Press and release the LOAD switch.		

Table 5-1. Control C-11816 Minimum Performance Test - CONT

Step	Procedure	Normal Indication	Corrective Action
11-Cont	d. Record the frequency loaded into the displayed preset channel. e. Repeat the previous four steps (a-d) for the remaining preset channels.		
12.	Rotate CHAN switch through all 19 channels, pressing the STATUS button for each channel.	When STATUS switch is pressed, f/s indicator displays frequency loaded into each channel. ID-1961() displays selected channel number.	FO-9, step 3
13.	Set M-P-G switch to GRD position.	ID-1961() displays G.	FO-9, step 20
14.	Press STATUS switch.	F/s indicator displays 243.000.	FO-9, step 15
15.	Set the M-P-G switch to MNL and set T-TONE switch to TONE position then release after test.	On the test set, XMIT KEY lamp is on. On the test adapter, the TONE KEY and XMIT KEY LEDs are on.	FO-9, step 13
16.	Use multimeter to measure DC voltage at GD ON/OFF test point on test set with function switch in MAIN and BOTH positions. Use GND test point for reference.	< 1 Vdc in BOTH. > 5 Vdc in MAIN.	FO-9, step 20
17.	Set the SQUELCH switch to off.	Rushing noise is heard in headset. On the test set, the SQUELCH OFF lamp is on.	FO-9, step 8
18.	Set the SQUELCH switch to ON.	Rushing noise disappears. On the test set, the SQUELCH OFF lamp is off.	FO-9, step 8
19.	Set the 2-3-A switch to A.	Warning tone heard in headset.	FO-9, step 22
20.	Return the 2-3-A switch to 3.	Warning tone stops.	FO-9, step 22

Table 5-1. Control C-11816 Minimum Performance Test - CONT

Step	Procedure	Normal Indication	Corrective Action
21.	On the control, set the M-P-G switch to PRESET, the CHAN switch to 20, and the frequency switches to 220.025.		
22.	On the control, press the LOAD switch.	F/s indicator displays M-LOAD.	FO-9, step 22
	MWOD LOADING		
23.	Load the MWOD into the control by setting the following switches in this order for each entry: (1). Set CHAN switch. (2). Set Frequency switches. (3). Set T-TONE switch to TONE position then release. Example: set CHAN switch to 20, then set frequency switches to 300.050, then set T-TONE switch to TONE position then release.	A tone is heard each time T-TONE switch is set to TONE except for when CHAN switch is set to 14, then a double beep is heard.	FO-9, step 22

CHAN Switch	Frequency Switches	T-TONE Switch
20	300.050	Tone
19	376.000	Tone
18	359.100	Tone
17	314.300	Tone
16	297.600	Tone
15	287.400	Tone
14	301.000	Tone
1	301.000	Tone

Table 5-1. Control C-11816 Minimum Performance Test - CONT

Step	Procedure	Normal Indication	Corrective Action
	ENTER VER/OP MODE		
24.	Perform the following steps to enter the VER/OP mode: a. Set the CHAN switch to 20. b. Set the M-P-G switch to PRESET. c. Set the frequency switches to 220.000. d. Press and release LOAD switch. e. Set the M-P-G switch to MANUAL.		
25.	Start the TOD clock in the control by selecting T position on T-TONE switch while simultaneously pressing TEST DISPLAY switch then release both switches.		
26.	On the control, set the 2-3-A to A.	No warning tone heard in headset.	FO-9, step 22
27.	On the control, set the M-P-G switch to PRESET, the CHAN switch to 20, and the frequency switches to 220.025.		
28.	On the control, press the LOAD switch.	F/s indicator displays M-LOAD.	FO-9, step 22
29.	Set the M-P-G switch to MNL, the CHAN switch to 1, and the frequency switches to 302.000.		
30.	Set T-TONE switch to TONE position.	A single beep is heard.	FO-9, step 22
31.	Repeat step 24.		
32.	On the control, set the 2-3-A switch to A.	A warning tone is heard.	FO-9, step 22
33.	On the control, set the M-P-G switch to PRESET, the CHAN switch to 20, and the frequency switches to 220.025.		

Table 5-1. Control C-11816 Minimum Performance Test - CONT

Step	Procedure	Normal Indication	Corrective Action
34.	On the control, press the LOAD switch.	F/s indicator displays M-LOAD.	FO-9, step 22
35.	Set the M-P-G switch to MNL, the CHAN switch to 1, and the frequency switches to 301.000.		
36.	Set T-TONE switch to TONE position.	A single beep is heard.	FO-9, step 22
37.	Repeat step 24.		
38.	On the control, set the 2-3-A to A.	No warning tone is heard.	FO-9, step 22
	MWOD ERASE		
39.	On the control, set the M-P-G switch to PRESET, the CHAN switch to 20, and the frequency switches to 220.050.		
40.	On the control, press the LOAD switch.	F/s indicator displays ERASE.	FO-9, step 22
41.	On the control, set T-TONE switch to TONE position.		
42.	Repeat step 24.		
43.	On the control, set the 2-3-A to A.	Warning tone is heard	FO-9, step 22
44.	On the control, set the M-P-G switch to PRESET, the CHAN switch to 20, and the frequency switches to 220.075		
45.	On the control, press the LOAD switch.	F/s indicator displays FMT.CHG.	FO-9, step 22
46.	Repeat step 24.		
47.	Disconnect the headset-microphone H-157 and the test adapter MX-9530 from the test set.		
48.	Connect handset H-33 or H-138 to AUDIO 1 jack on control unit.		

Table 5-1. Control C-11816 Minimum Performance Test - CONT

Step	Procedure	Normal Indication	Corrective Action
49.	Set frequency switches to 300.000.		
50.	Transmit voice using the handset and listen for sidetone.	Sidetone present while transmitting.	FO-9, step 23
51.	Adjust the VOLUME control on the control unit.	Sidetone level increases or decreases with setting of VOLUME control.	FO-9, step 7
52.	Repeat previous two steps with handset connected to AUDIO 2 connector on control unit.	As in previous two steps	
53.	Measure voltage at control unit SPEAKER connector J2-C.	+ 28 Vdc ±2.8 Vdc	Replace W1.
54.	Remove power and disconnect control unit from test adapter.		
55.	Using a digital multimeter, measure resistance between following pins.		
	J1-B to J3-B	Continuity	Replace W1
	J1-C to J3-F	Continuity	
	J1-B to J3-G	Continuity	
56.	Measure resistance between J1-J and J2-D.	Resistance is 2200 Ohms ± 220 Ohms.	Replace W1
57.	Using a digital voltmeter, perform the following checks.		FO-9, step 21

FROM	TO	KEEP ALIVE SWITCH S2	
J1-P	J1-D	ON	Continuity
J1-G	J1-H	ON	Continuity
J1-P	J1-D	OFF	Open (>100K ohms)
J1-G	J1-H	OFF	Open (>100K ohms)
J1-B	J3-B	EITHER	Continuity
J1-C	J3-F	EITHER	Continuity
J1-B	J3-G	EITHER	Continuity
J1-I	J1-J	CENTER	Open (>100K ohms)
J1-I	J1-J	DOWN	Continuity

58.	Testing is complete. Remove power and disconnect all test equipment.		

Section II. TROUBLESHOOTING

5-4 GENERAL.

This section contains troubleshooting instructions for isolating a failure in the control to a defective SRU. The troubleshooting instructions are in the form of logic diagrams. Each step of the diagrams is used to fault isolate a specific function of the control unit. Table 5-2 lists the fault isolation steps and the corresponding fault symptoms. The fault isolation steps are also listed under the corrective action column of the minimum performance test (table 5-1). If the fault was detected during the performance test, proceed to the step in the flow diagrams indicated under the corrective action column. Otherwise, refer to table 5-2 to identify which step to begin fault isolation of the failed function.

5-5 TROUBLESHOOTING FLOW DIAGRAMS.

The control unit troubleshooting flow diagram FO-9 is located in the rear of the manual. Refer to table 5-2 to determine which step to begin troubleshooting or proceed as directed in the corrective actions column of the minimum performance test.

5-6 TROUBLESHOOTING AIDS.

The following information is provided to aid in the troubleshooting of the control unit:

Control C-11816 wiring harness schematic diagram	Figure FO-10
Control C-11816 assembly schematic diagram	Figure FO-11
Control C-11816 connector pin assignments	Figure FO-12

Table 5-2. Troubleshooting Symptoms Index

Symptom	Fault Isolation
AJ mode fails	FO-9, step 22
Backlighting faulty	FO-9, step 17
Channel select failure	FO-9, step 3
Display fails with KYK-13 fill device connected.	FO-9, step 4,5,6
DISPLAY TEST fails	FO-9, step 11
Frequency select failure	FO-9, step 10
GUARD ON/OFF failure	FO-9, step 20
No transmit key or transmit audio	FO-9, step 18
TOD SEND switch fails	FO-9. step 19
VOL control fault	FO-9, step 7
MWOD LOAD, FMT.CHG, VER/OP, or ERASE modes fail	FO-9, step 22
KEEP ALIVE function fails	FO-9, step 21
No guard receiver with function switch in BOTH	FO-9, step 9
No panel lamps	FO-9, step 16
LOAD switch fails	FO-9, step 12
STATUS switch fails	FO-9, step 15
SQUELCH switch fails	FO-9, step 8
T-TONE switch fails	FO-9, step 13
ZERO switch fails	FO-9, step 14
Unit will not power-up	FO-9, step 1
Unit will not power-up in BOTH position of function switch	FO-9, step 2
No receive audio from AUDIO 1 or AUDIO 2 connectors	FO-9, step 23

Section III. REPAIR INSTRUCTIONS

5-7 GENERAL.

This section contains repair instructions which detail the removal, installation, and packaging of the SRUs of the control unit.

5-8 ESD SENSITIVE DEVICES.

The front panel interface CCA and the power supply CCA contain components which are sensitive to electro-static discharges (ESD). Procedures within this section which require ESD handling precautions are marked with the symbol (ESD) and must be performed as written while observing the ESD handling instructions in TO 00-25-234, General Shop Practice Requirements For the Repair, Maintenance, and Test of Electronic Equipment.

5-9 PACKING AND UNPACKING INSTRUCTIONS. (ESD)

CAUTION

Observe precautions for handling electrostatic discharge sensitive items.

When unpacking the control unit, check for completeness and any evidence of damage during shipping. Retain the packing material if new packing material is not available. For packaging of the control unit or subassemblies, refer to the packaging instructions for ESD sensitive devices in TO 00-25-234 in conjunction with figure 5-2 (control unit) and figure 5-3 (all other SRUs).

5-10 CONTROL UNIT DISASSEMBLY AND ASSEMBLY. (ESD)

The following paragraphs describe the steps to remove and install the following SRUs. Refer to figure FO-13 for component locations and to aid in removal and installation of SRUs.

a. Rear housing assembly (A2)
b. Front panel assembly (A1)
c. Front panel interface CCA (A1A1)
d. LCD modules (DS1, DS2)
e. Power supply CCA (A1A4)
f. Audio connector CCA (A1A5)
g. Panel assembly, switching unit (A1A6)
h. Wiring harness (W1)

5-10.1 Rear Housing (A2) Removal. Perform following steps to remove rear housing from front panel assembly.

CAUTION

Observe precautions for handling electrostatic discharge sensitive items.

a. Remove eight cross-tipped screws from front panel assembly (A1) securing rear housing (A2).

b. Open rear housing assembly to gain access to wiring harness connectors.

c. Disconnect wiring harness P1 connector from interface CCA (A1A1), P2 connector from power supply CCA (A1A4) and P3 connector from audio interface CCA (A1A5).

d. Remove rear housing (A2) completely from front panel assembly (A1).

5-10.2 Rear Housing (A2) Installation. Perform following steps to install rear housing to front panel assembly.

CAUTION

Observe precautions for handling electrostatic discharge sensitive items.

a. Inspect o-rings on each of eight cross-tipped screws removed in step a of previous paragraph for cracks, tears, or evidence of wear. Replace entire screw if o-ring is damaged.

b. On rear of front panel assembly (A1), inspect gasket (o-ring) on outside edge of front panel assembly for cracks, tears, or evidence of wear. If replacement of gasket is indicated, perform following steps to install a new gasket.

(1). Remove old gasket and clean groove of old adhesive.

(2). Apply adhesive, type I, per MIL-A-46146 to groove of front plate.

(3). Apply adhesive, type I, per MIL-A-46146 to butt ends of new gasket.

(4). Install new gasket in groove of front plate , ensuring splice in gasket is located on a straight section of groove and not in a corner. Ensure there is not a gap where gasket is spliced.

c. Apply sealant, per MIL-G-4343, Dow Corning #55 M or equivalent, to gasket prior to mating with rear housing. Clean excess sealant from surface of front plate.

d. Connect wiring harness P1 connector to interface CCA (A1A1), P3 connector to audio interface CCA (A1A5), and P2 connector to power supply CCA (A1A4).

e. Mate rear housing (A2) to front panel assembly (A1) and secure with eight cross-tipped screws.

5-10.3 Switching Unit Panel Assembly (A1A6) Removal. (ESD) Perform following steps to remove switching unit panel assembly from front panel assembly.

CAUTION

Observe precautions for handling electrostatic discharge sensitive items.

a. Remove LCD modules from front panel assembly, refer to LCD display removal procedures (para. 5-10.5).

b. Remove ten screws securing switching unit panel assembly (A1A6) to front panel assembly (A1).

c. Gently remove switching unit panel assembly (A1A6), disconnecting connectors J1 and J2 from interface CCA (A1A1).

5-10.4 Switching Unit Panel Assembly (A1A6) Installation. (ESD) Perform following steps to install switching unit panel assembly to front panel assembly.

CAUTION

Observe precautions for handling electrostatic discharge sensitive items.

a. Inspect gasket on rear of switching unit panel assembly (A1A6) for cracks, tears, or evidence of wear. If gasket is damaged, replace with new gasket by performing following steps.

(1). Remove old gasket and clean switching unit panel assembly (A1A6) surface of old adhesive and gasket material.

(2). Apply lubricant, Dow Corning FS-3451 or equivalent, to new gasket.

(3). Install gasket on switching unit panel assembly.

b. Mate switching unit panel assembly (A1A6) with front panel assembly (A1), carefully connecting J1 and J2.

c. Apply sealant grade C, per MIL-S-22473, to each cross-tipped screw and secure switching unit panel assembly to front panel assembly.

d. Install LCD modules into front panel assembly, refer to LCD display installation procedures (para. 5-10.6).

5-10.5 LCD Display Removal (DS1, DS2). (ESD) Perform following steps to remove either CHAN display or frequency display.

CAUTION

Observe precautions for handling electrostatic discharge sensitive items.

a. Loosen four captive screws securing LCD display to switching unit panel assembly (A1A6).

b. Remove display from switching unit panel assembly.

5-10.6 LCD Display Installation (DS1, DS2). **(ESD)** Perform following steps to install either CHAN display or frequency display.

CAUTION

Observe precautions for handling electrostatic discharge sensitive items.

a. Inspect LCD display o-ring for cracks, tears, or evidence of wear. If o-ring is damaged, replace with a new o-ring as follows.

(1). Remove old o-ring and clean mating surface of switching unit panel assembly (A1A6).

(2). Apply lubricant, Dow Corning FS-3451, to new o-ring and install o-ring in switching unit panel assembly (A1A6).

b. Install LCD display into switching unit panel assembly (A1A6).

c. Inspect o-ring of each captive screw for cracks, tears, or evidence of wear. If o-ring is damaged, replace entire screw.

d. Secure LCD display to switching unit panel assembly (A1A6) using four screws.

5-10.7 Audio Connector Interface CCA (A1A5) Removal. Perform following steps to remove audio connector interface CCA.

a. Remove rear housing (A2) from front panel assembly (A1), refer to rear housing removal procedures (para. 5-10.1).

c. Using a spanner wrench, loosen and remove mounting nut from AUDIO 1 and AUDIO 2 (J1 and J2) connectors on front panel assembly (A1).

d. On rear of front panel assembly (A1), remove audio connector interface CCA (A1A5) with AUDIO 1 and AUDIO 2 connectors attached.

e. If audio connector interface CCA (A1A5) is being replaced, unsolder AUDIO 1 and AUDIO 2 connectors and remove from audio connector interface CCA.

5-10.8 Audio Connector Interface CCA (A1A5) Installation. Perform following steps to install audio connector interface CCA.

a. If a new audio connector interface CCA (A1A5) is being installed, solder AUDIO 1 and AUDIO 2 connectors to audio interface CCA.

b. Install audio connector interface CCA with attached AUDIO 1 and AUDIO 2 connectors into front panel assembly (A1).

c. Apply locking compound, per table 2-1, to threads of AUDIO 1 and AUDIO 2 connectors.

d. Install mounting nuts on AUDIO 1 and AUDIO 2 connectors and tighten using a spanner wrench.

e. Install rear housing (A2) to front panel assembly (A1), refer to rear housing installation procedures (para. 5-10.2).

5-10.9 Power Supply CCA (A1A4) Removal. (ESD) Perform following steps to remove power supply CCA.

CAUTION

Observe precautions for handling electrostatic discharge sensitive items.

a. Remove rear housing (A2), refer to rear housing removal procedures (5-10.1).

b. Remove ten cross-tipped screws and washers from rear of power supply CCA (A1A4). Remove power supply CCA from mounting plate.

5-10.10 Power Supply CCA (A1A4) Installation. (ESD) Perform following steps to install power supply CCA.

CAUTION

Observe precautions for handling electrostatic discharge sensitive items.

a. Apply sealant grade C, per MIL-S-22473, to threads of ten cross-tipped screws. Secure power supply CCA (A1A4) onto stand-offs of mounting plate with ten cross-tipped screws and washers.

b. Install rear housing (A2) onto front panel assembly (A1), refer to rear housing installation procedures (5-10.2).

5-10.11 Interface CCA (A1A1) Removal. (ESD) Perform following steps to remove interface CCA.

CAUTION

Observe precautions for handling electrostatic discharge sensitive items.

a. Remove rear housing (A2) from front panel assembly (A1), refer to rear housing removal procedures (5-10.1).

NOTE

Removal of power supply CCA (A1A4) is not required when removing mounting plate.

b. Remove four cross-tipped screws securing mounting plate over interface CCA (A1A1) and remove.

c. Remove four screws securing interface CCA (A1A1).

d. Remove one cross-tipped screw from side of switching unit housing.

e. Gently remove interface CCA (A1A1) from front panel assembly (A1).

5-10.12 Interface CCA (A1A1) Installation. (ESD) Perform following steps to install interface CCA.

CAUTION

Observe precautions for handling electrostatic discharge sensitive items.

a. Install interface CCA (A1A1) into switching unit housing, ensuring connectors are firmly seated.

b. Install cross-tipped screw into side of switching unit housing.

c. Install four screws securing interface CCA (A1A1) to front panel assembly (A1).

d. Install mounting plate over interface CCA (A1A1) using four cross-tipped screws.

e. Install rear housing (A2), refer to rear housing installation procedures (5-10.2).

5-10.13 Wiring Harness (W1) Removal. Perform following steps to remove wiring harness.

a. Remove rear housing (A2), refer to rear housing removal procedures (5-10.1).

b. Remove four cross-tipped screws securing audio filter CCA (A1A5) to rear housing (A2), then remove audio filter CCA.

c. Loosen and remove lock nuts on connectors J1 (rear connector), J2 (SPEAKER), and J3 (TOD).

d. Loosen and remove lock nut on switch S2 (KEEP ALIVE).

e. Gently remove connectors J1, J2, J3 and switch S2 from rear housing assembly (A2).

f. Remove wiring harness from rear housing assembly (A2).

5-10.14 Wiring Harness (W1) Installation. Perform following steps to install wiring harness.

a. Insert connectors J1, J2, J3 and switch S2 into holes in rear housing assembly (A2) and secure with lock nuts.

b. Install audio filter CCA (A1A5) onto rear housing (A2) and secure with four cross-tipped screws.

c. Install rear housing (A2), refer to rear housing installation procedures (5-10.2).

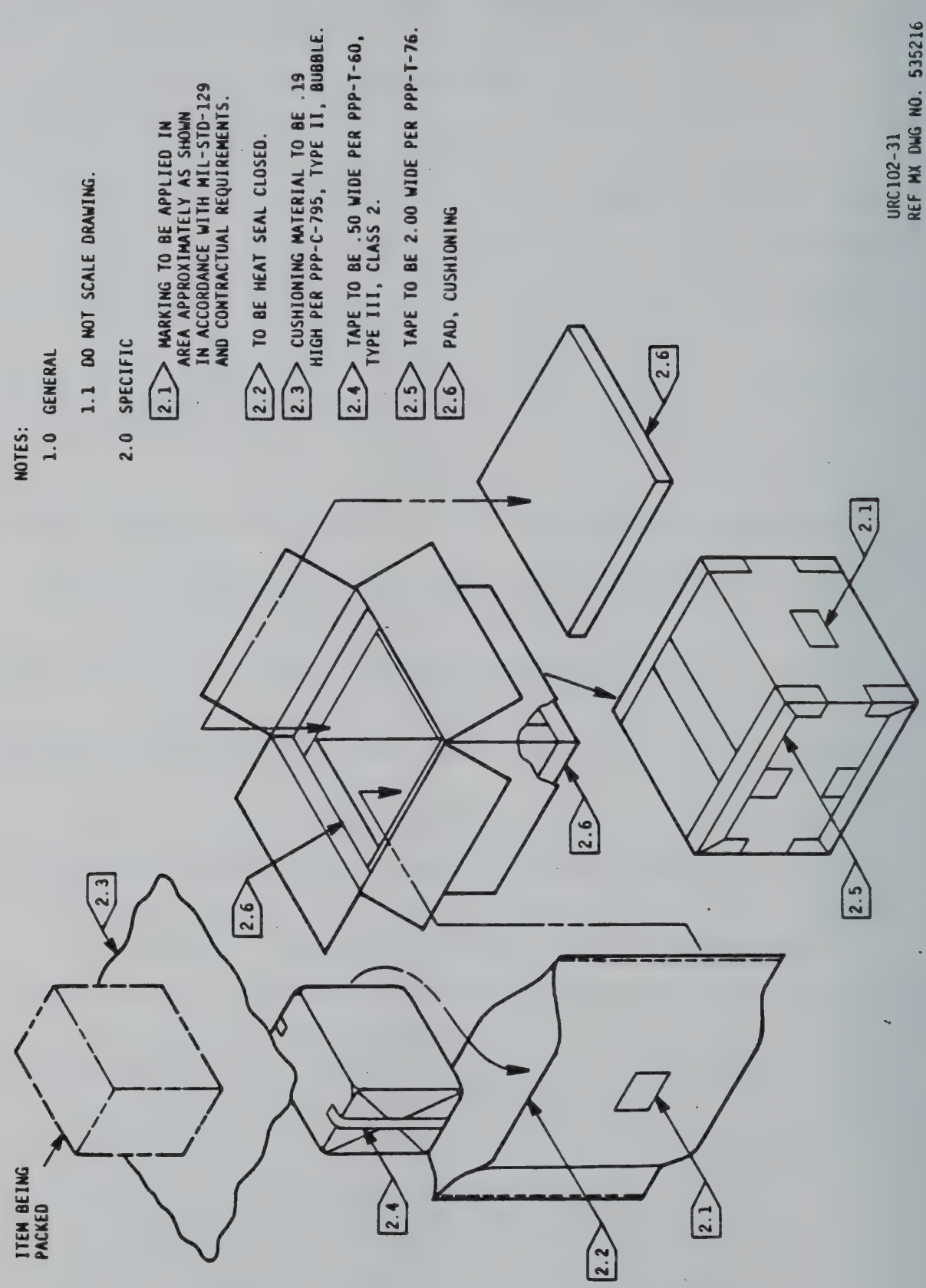

NOTES:
1.0 GENERAL
1.1 DO NOT SCALE DRAWING.
2.0 SPECIFIC
2.1 MARKING TO BE APPLIED IN AREA APPROXIMATELY AS SHOWN IN ACCORDANCE WITH MIL-STD-129 AND CONTRACTUAL REQUIREMENTS.
2.2 TO BE HEAT SEAL CLOSED.
2.3 CUSHIONING MATERIAL TO BE .19 HIGH PER PPP-C-795, TYPE II, BUBBLE.
2.4 TAPE TO BE .50 WIDE PER PPP-T-60, TYPE III, CLASS 2.
2.5 TAPE TO BE 2.00 WIDE PER PPP-T-76.
2.6 PAD, CUSHIONING
URC102-31
REF MX DWG NO. 535216
ITEM BEING PACKED
2.1
2.2
2.3
2.4
2.5
2.6

Figure 5-2. Control Unit Packaging Diagram

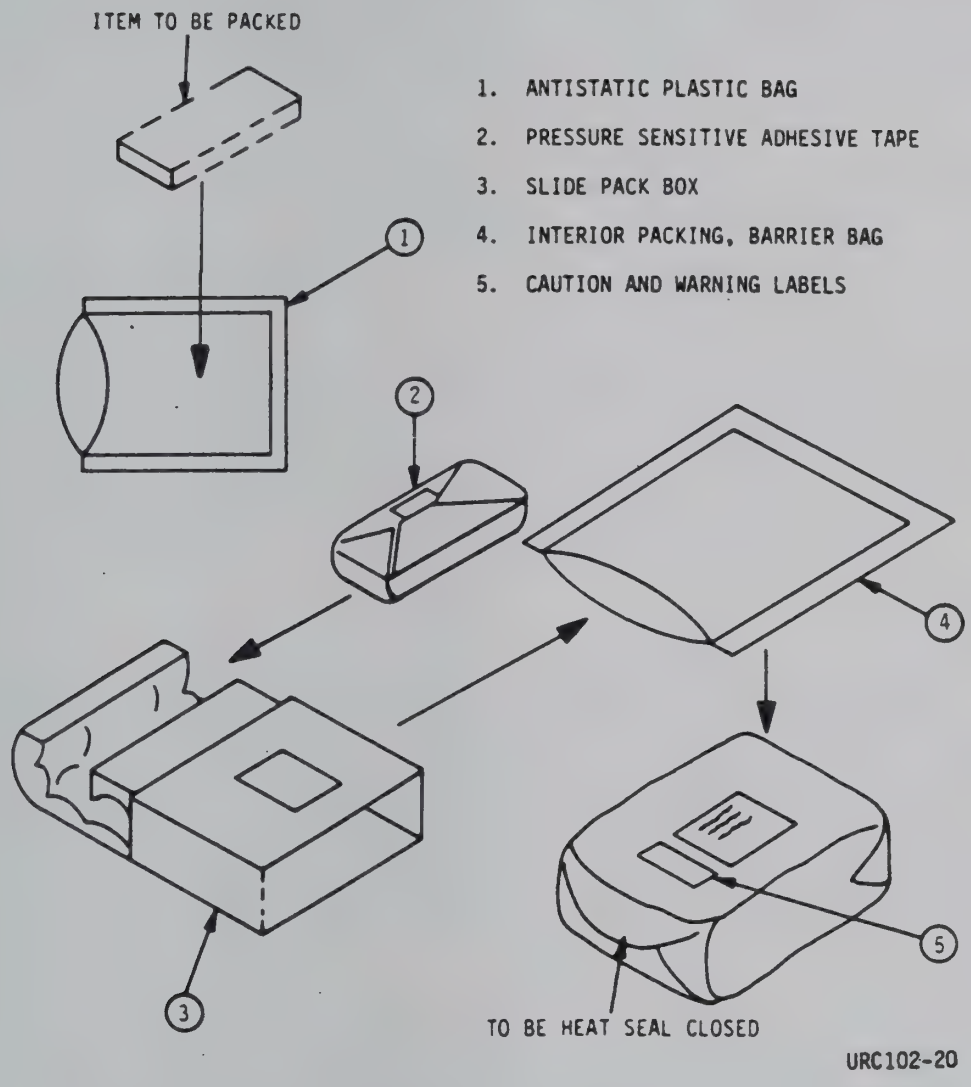


Figure 5-3. General Use Packaging Diagram

CHAPTER 6

MAINTENANCE OF MOUNTING BASE MT-6165

6-1 GENERAL.

This chapter contains the intermediate maintenance procedures for the mounting base. Section I contains a minimum performance test which tests the functions of the control to minimum acceptable standards. Section II contains troubleshooting information to fault isolate the control unit to shop replaceable units (SRUs). Section III details the procedures for removing, repairing, installing, and packing SRUs.

Section I. MOUNTING BASE TESTING

6-2 MINIMUM PERFORMANCE TEST.

The minimum performance test for the mounting base is detailed in table 6-1. This test checks the functions of the mounting base and establishes the minimum acceptable performance criteria. If a normal indication is not obtained during the performance of the test, proceed to the troubleshooting flow diagram and step listed under the corrective action column for the failed step. Figure 6-1 illustrates the test equipment necessary and the setup of the equipment for the test. Refer to chapter 2 for information on the special and standard test equipment.

NOTE

The complete test procedure may be performed to determine the serviceability of a mounting base, however, it is not necessary to perform the entire test procedure when verifying reported failures. Performing the steps which relate to the reported fault is sufficient. The entire minimum performance test should be performed on each control unit that is disassembled for troubleshooting or repair to ensure that the original problem is corrected and that no additional faults were induced during the maintenance action.

6-3 CALIBRATION.

Calibration of oscillator A1A1Y1 is required every 5 years, whenever the frequency is found to be out of tolerance, or whenever the radio frequency oscillator is returned for a frequency malfunction. Calibration of the oscillator will be performed by PMEL using the MX-10247/ARM-175 Test Adapter (part of TS-3919/ARM-173 Radio Test Set). Set oscillator frequency to 1 part in 10 to the 10th after 1 hour warmup. Calibrate in accordance with applicable section in TO 33K3-4-1-22.

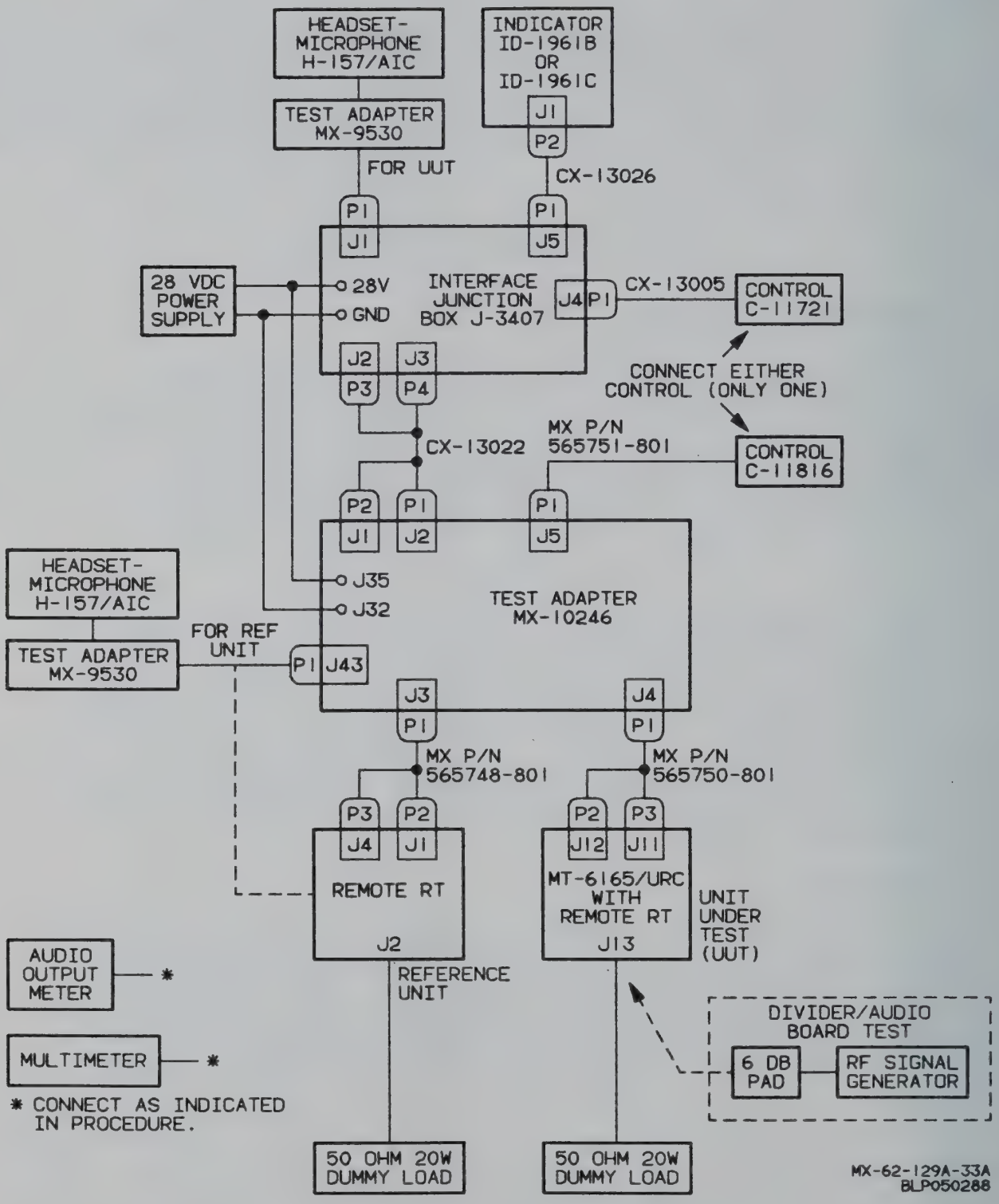


Figure 6-1. Mounting Base Test Setup

Table 6-1. Mounting Base Minimum Performance Test

Step	Procedure	Normal Indication	Corrective Action
1.	Remove RT from mounting base as described in Section III. Test RT as described in T.O. 12R2-2ARC164-X2. If RT passes minimum performance test, install in mounting base and perform the following steps.		
2.	Connect test equipment as shown in figure 6-1 for Divider/Audio board test.		
3.	Adjust power supply output to +28 ±0.5 Vdc.		
4.	On the MX-10246/ARM-173 Test Adapter (test adapter), set the following switches to the positions indicated.		

Switch	Position
POWER (S1)	OFF
BTRY PWR (S2)	OFF
TOD HARDWIRE (S3)	OFF
NORM PWR (S4)	ON
STD KEY (S5)	OFF (mid)
RFO (S6)	OPEN
SERIAL CONTROL (S7)	BOTH
TAKE CONTROL (S8)	RT-1168A
STD POWER CONTROL (S9)	OPEN
VOLUME CONTROL (S10)	COMM
KEEP ALIVE (S11)	OFF
TOD (S12)	EITHER

Table 6-1. Mounting Base Minimum Performance Test - CONT

Step	Procedure	Normal Indication	Corrective Action
5.	On the J-3407/ARM-173 Interface Junction Box (test set), set the following switches to the positions indicated. Switch — Position PRIME POWER ON/OFF — OFF X-MODE ENABLE — OFF XMIT KEY — Mid (off) TONE KEY — Mid (off) PRESET READ — CHAN TAKE CONTROL — CONT METER INPUT — CONT		
6.	On the control unit, set the following switches to the positions indicated. Switch — Position Function switch — OFF VOL (volume) — Fully ccw SQUELCH — ON M-P-G — PRESET		
7.	Turn on the equipment in the following sequence: (1) test adapter, (2) test set.		
8.	Set the control unit function switch to the MAIN position.	All segments of f/s and CHAN indicators light momentarily; then display selected channel and frequency. ID-1961() displays the selected channel.	
9.	Adjust RF signal generator for a 277.775 MHz signal, internally modulated 90% with 1000 Hz at an RF output level of 1 millivolt.		
10.	Adjust the output power meter for a 150 Ohm load and connect it to the RCV AUDIO test points on the test set.		

Table 6-1. Mounting Base Minimum Performance Test - CONT

Step	Procedure	Normal Indication	Corrective Action
11.	Observe the output power meter.	Output power meter reads 180 milliwatts minimum, 360 milliwatts maximum	FO-14, step 3
12.	Disconnect the 6 dB pad and RF signal generator and connect the 20 watt dummy load to J13 of the mounting base.		
13.	Load a single WOD into the mounting base and reference unit by performing the following steps.		
	a. Set the M-P-G switch to PRESET.		
	b. Set the CHAN switch to channel 20.		
	c. Use the frequency switches to select the WOD element.		
	d. Lift the access cover and press the PRESET switch.		
	e. Use the CHAN switch to select the next lower channel.		
	f. Repeat steps a. through e. until all WOD elements are loaded.		
	g. Set the CHAN switch to 20, then progressively set the CHAN switch to the next lower channel until a double beep is heard.	Listen for a single beep in the headset in each position of the CHAN switch except the last position which is a double beep.	
14.	Set the control unit M-P-G switch to MNL and the frequency switches to 320.000.		
15.	Set the test adapter STD POWER CONTROL switch to BYPASS and the SERIAL CONTROL switch to UUT.		

Table 6-1. Mounting Base Minimum Performance Test - CONT

Step	Procedure	Normal Indication	Corrective Action
16.	Start the TOD clock in the UUT by holding T-TONE switch to T position T while simultaneously pressing the TEST DISPLAY switch.	Test adapter current meter reading increases momentarily.	
17.	Set the test adapter SERIAL CONTROL switch to BOTH.		
18.	Send TOD to the reference unit by setting T-TONE switch to TONE position for two seconds.	TOD tone followed by a clear tone (1020 Hz) is heard in both headsets.	
19.	Set the 2-3-A switch to A.	No warning tone heard in either headset.	
20.	Transmit voice from the reference unit to the UUT using headset-microphone connected to test adapter.	Voice intelligible on headset connected to test set.	FO-14, step 5
21.	Transmit voice from the UUT to the reference unit using headset-microphone connected to test set.	Voice intelligible on headset connected to test adapter.	FO-14, step 5
22.	Set the test set X-MODE ENABLE switch to ON.		
23.	Transmit voice from the reference unit to the UUT using the headset-microphone connected to the test adapter.	Voice intelligible on headset connected to test set.	FO-14, step 5
24.	Transmit voice from the UUT to the reference unit using the headset-microphone connected to the test set.	Voice intelligible on headset connected to test adapter.	FO-14, step 5
25.	Set the test set X-MODE ENABLE switch to OFF.		
26.	On the mounting base set the KEEP ALIVE ON/OFF switch to ON.		
27.	Set the control unit function switch to OFF.		

Table 6-1. Mounting Base Minimum Performance Test - CONT

Step	Procedure	Normal Indication	Corrective Action
28.	Set the test set PRIME POWER IN switch to OFF and set the test adapter POWER switch to OFF for 30-45 seconds.		
29.	Set the test adapter POWER switch to ON; the test set PRIME POWER IN switch to ON; and the control unit function switch to MAIN.	Warning tone heard in headset connected to test adapter, no warning tone heard in headset connected to test set.	FO-14, step 2
30.	On the mounting base, set the KEEP ALIVE ON/OFF switch to OFF.		
31.	Set the control unit function switch to OFF; the test set PRIME POWER IN switch to OFF; and the test adapter POWER switch to OFF.		
32.	Disconnect the cable from the mounting adapter connectors J11 and J12.		
33.	Remove the RT from the mounting base. (refer to para. 6-10.5)		
	CAUTION In the following step, remove the Divider/Audio board slowly as the P2 to J2 connector is still attached.		
34.	Lift the Divider/Audio board straight up and clear of the guides, releasing card connector J1 from P5.		

Table 6-1. Mounting Base Minimum Performance Test - CONT

Step	Procedure			Normal Indication	Corrective Action
35.	Use a multimeter to perform the following checks.				
	FROM	TO	KEEP ALIVE SWITCH S1 POSITION		
	J2-F	J12-A	OFF	OPEN	Repair or
	J11-M	J11-L	OFF	OPEN	replace W1.
	J2-F	P5-G	ON	CONTINUITY	
	J2-F	J12-A	ON	CONTINUITY	
	J11-M	J11-L	ON	CONTINUITY	
	J11-M	P5-V	ON	CONTINUITY	
36.	Using a mulitmeter, perform the following checks:				
	FROM	TO	TOD SEND SWITCH S2 POSITION		
	J11-M	P6-5	EITHER	CONTINUITY	Repair or
	J2-G	J12-Y	EITHER	CONTINUITY	replace W1.
	J2-K	P5-I	EITHER	CONTINUITY	
	P4-7	J11-K	EITHER	CONTINUITY	
	P4-3	J11-N	EITHER	CONTINUITY	
	P4-7	P4-3	OUT	OPEN	
	P4-7	P4-3	IN	CONTINUITY	
	SINGLE CONDUCTORS				
	P1-B	J12-W		CONTINUITY	
	P1-Z	J12-C		CONTINUITY	
	P4-8	J11-Z		CONTINUITY	
	P4-5	J11-H		CONTINUITY	
37.	Testing is complete. Remove power and disconnect all test equipment.				

Section II. TROUBLESHOOTING

6-4 GENERAL.

This section contains troubleshooting instructions for isolating a failure in the mounting base to a defective SRU. The troubleshooting instructions are in the form of a logic diagram. Each step of the diagram is used to fault isolate a specific function of the mounting base. Table 6-2 lists the fault symptoms associated with the troubleshooting diagram. If the fault was detected during the performance test, proceed to the step in the flow diagram corresponding to the fault symptom.

6-5 TROUBLESHOOTING FLOW DIAGRAM.

The mounting base troubleshooting flow diagram figure FO-14 is located in the rear of the manual. Refer to table 6-2 to determine which step to begin troubleshooting or proceed as directed in the corrective actions column of the minimum performance test.

6-6 TROUBLESHOOTING AIDS.

Figure 6-2 shows the mounting base component locations. Figure FO-15 is a schematic diagram of the mounting base interconnect cable.

Table 6-2. Troubleshooting Symptom Index

DC power distribution incorrect with primary power applied.	FO-14, step 1
Battery circuit incorrect.	FO-14, step 2
Receive audio output incorrect.	FO-14, step 3
Oscillator 800 KHz not providing sync in RT.	FO-14, step 4
Transmit or receiver functions incorrect - RT tests correctly.	FO-14, step 5

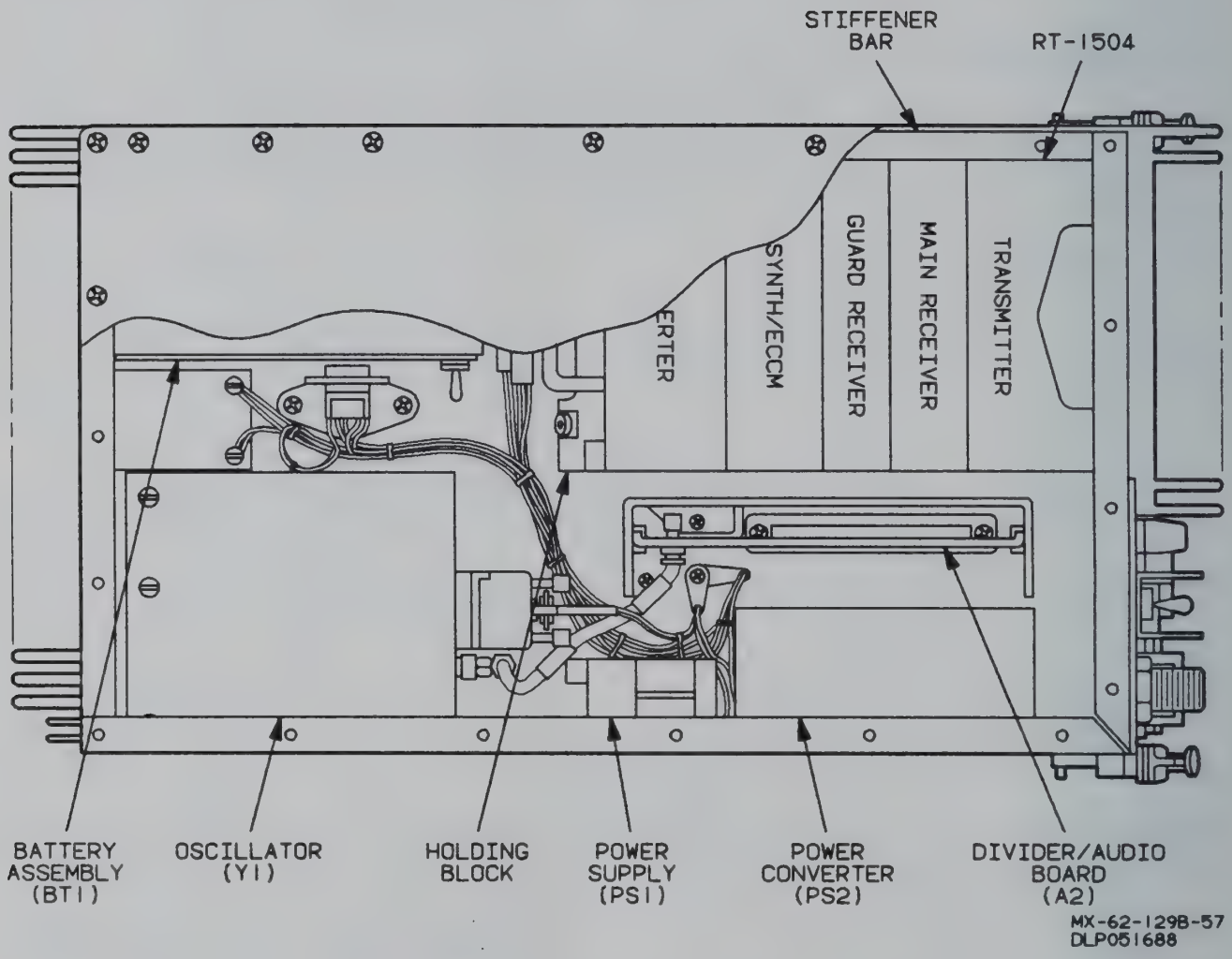


Figure 6-2. Mounting Base Subassembly Locations

Section III. REPAIR INSTRUCTIONS

6-7 GENERAL.

This section contains repair instructions which detail the removal, installation, and packaging instructions for the mounting base SRUs.

6-8 ESD SENSITIVE DEVICES.

The mounting adapter SRUs contain components which are sensitive to electrostatic discharges (ESD). Procedures within this section which require ESD handling precautions are marked with the symbol (ESD) and must be performed as written while observing the ESD handling instructions in TO 00-25-234, General Shop Practice Requirements For the Repair, Maintenance, and Test of Electronic Equipment.

6-9 PACKING AND UNPACKING INSTRUCTIONS. (ESD)

When unpacking, check the item for completeness and any evidence of damage during shipping. Retain the packing material if new packing material is not available. To package mounting base SRUs, refer to the packaging instructions for ESD sensitive devices in TO 00-25-234 in conjunction with the following figures:

Mounting base chassis packing	Figure 6-3.
Oscillator packing	Figure 6-4.
Divider/Audio board packing	Figure 6-5.
Power supply packing	Figure 5-3.

NOTE

Remove all SRUs from the mounting base chassis prior to sending it to depot repair.

6-10 SRU DISASSEMBLY AND ASSEMBLY.

The following procedures detail the steps necessary to remove and install the SRUs of the mounting base.

6-10.1 Top Cover Removal. Remove top cover by removing 19 cross-tip screws and washers from top of mounting base.

6-10.2 Top Cover Installation. Replace top cover by securing 19 cross-tip screws and washers to top of mounting base.

6-10.3 Battery BT1 Removal. Remove battery BT1 as follows.

a. Remove MT-6165 mount cover, refer to top cover removal procedures.

b. Remove four screws from side of case securing stiffener bar, then remove stiffener bar (figure 6-2).

c. Set KEEP ALIVE ON/OFF switch S1 to OFF.

d. Disconnect P6 from battery connector J1.

WARNING

Each cell of battery pack is equipped with a rubber plug to release any over-pressure of hydrogen gas caused by charging. Should an over-pressure occur, leaking of acid is possible. Prior to removal of battery pack, inspect for cracks or breaks in case and evidence of leakage. Should signs of leakage or corrosion be found, protective rubber gloves must be worn when removing battery pack.

e. Remove four cross-tip screws securing battery to side of mounting base.

f. Release four cross-tip screws securing L1 to rear of mount. Loosen L1, then remove battery.

6-10.4 Battery BT1 Installation. Replace battery BT1 as follows.

a. Apply silicone compound, per MIL-C-47113, Dow Corning 340 or equivalent, to mounting surface of L1.

b. Apply sealant, grade C, per table 2-1, to threads of four cross-tip screws. Secure L1 to rear of mount with four cross-tip screws.

c. Tighten four cross-tip screws securing battery to side of mounting base.

d. Connect P6 to battery connector J1.

e. Set KEEP ALIVE ON/OFF switch S1 to ON.

f. Position stiffener bar in place and secure four cross-tip screws to side of case (figure 6-2)

f. Replace top cover, refer to top cover installation procedures.

6-10.5 RT Removal. RT removal is accomplished as follows:

a. Remove top cover, refer to top cover removal procedures.

b. Remove battery BT1, refer to battery BT1 removal procedures.

c. Release four captive mounting screws in heat sink (see figure 6-6).

d. On RT disconnect P2 from J2 and P1 from J1.

e. Remove holding block by releasing two hex-head socket screws.

f. Pull RT straight back in mount MT-6165 to disconnect P4 from J4, then remove RT.

6-10.6 RT Installation. RT replacement is accomplished as follows:

a. Remove cover plate over J4 (if installed), then remove four round-head screws from corners of flex cable bracket.

b. Position RT in place, then slide RT straight back in mount to connect P4 to J4.

c. Replace holding block by securing two hex-head socket screws.

d. On RT, connect P2 to J2 and P1 to J1.

e. Secure four captive mounting screws in heat sink (see figure 6-6).

f. Replace battery BT1, refer to battery BT1 installation procedures.

g. Replace top cover, refer to top cover installation procedures.

6-10.7 Divider/Audio Board, A2, Removal. (ESD) Remove divider/audio board, A2 as follows:

CAUTION

Observe precautions for handling electrostatic discharge sensitive items.

a. Remove top cover, refer to top cover removal procedures.

b. Pull card A2 straight up and clear of guides, releasing card connector J1
from P5.

c. Disconnect coax connector P2 from A2J2.

6-10.8 Divider/Audio Board, A2, Installation. (ESD) Replace divider/audio board, A2 as follows:

CAUTION

Observe precautions for handling electrostatic discharge sensitive items.

a. Connect coax connector P2 to A2J2.

b. Secure card connector J1 to P5 by pushing card A2 straight down into guides.

c. Replace top cover, refer to top cover installation procedures.

6-10.9 Oscillator Y1 Removal. (ESD) Oscillator Y1 removal is accomplished as follows:

CAUTION

Observe precautions for handling electrostatic discharge sensitive items.

a. Remove top cover, refer to top cover removal procedures.

b. Disconnect coax connector P1 from oscillator jack J1 and plug P3 from oscillator jack J2.

c. Remove eight cross-tip screws securing oscillator to rear of mount MT-6165, then remove oscillator.

6-10.10 Oscillator Y1 Installation. (ESD) Oscillator Y1 replacement is accomplished as follows:

CAUTION

Observe precautions for handling electrostatic discharge sensitive items.

NOTE

Remove middle screw on side of Y1 where L1 is to be mounted to allow for proper mounting of L1.

a. Apply silicone compound, per MIL-C-47113, Dow Corning 340 or equivalent, to mounting surface of Y1. Secure oscillator to rear of mount with eight cross-tip screws.

b. Connect coax connector P1 to oscillator jack J1 and P3 to oscillator jack J2.

c. Replace top cover, refer to top cover installation procedures.

6-10.11 Power Supply PS1 Removal. (ESD) Power supply PS1 removal is accomplished as follows:

CAUTION

Observe precautions for handling electrostatic discharge sensitive items.

a. Remove top cover, refer to top cover removal procedures.

b. Disconect connector P1 of PS1 from J3 of MT-6165.

c. Remove four cross-tip screws securing PS1 to mount MT-6165 and remove PS1.

6-10.12 Power Supply PS1 Installation. (ESD) Power supply PS1 replacement is accomplished as follows:

CAUTION

Observe precautions for handling electrostatic discharge sensitive items.

a. Apply silicone compound, per MIL-C-47113, Dow Corning 340 or equivanent, to mounting surface of PS1.

b. Apply sealant, grade C, per table 2-1, to threads of four cross-tip screws. Secure PS1 to mount with four cross-tip screws.

c. Connect connector P1 of PS1 to J3 of MT-6165.

d. Replace top cover, refer to top cover installation procedures.

6-10.13 DC/DC Converter PS2 Removal. (ESD) DC/DC converter PS2 removal is accomplished as follows:

CAUTION

Observe precautions for handling electrostatic discharge sensitive items.

a. Remove top cover, refer to top cover removal procedures.

b. Remove four cross-tip screws securing PS2 to mount MT-6165 side.

c. Noting position, mark, unsolder and remove six wires from output terminals on side of converter.

d. Noting position, mark, unsolder and remove two wires from input terminals on side of DC/DC converter, then remove DC/DC converter.

6-10.14 DC/DC Converter PS2 Installation. (ESD) DC/DC converter PS2 replacement is accomplished as follows:

CAUTION

Observe precautions for handling electrostatic discharge sensitive items.

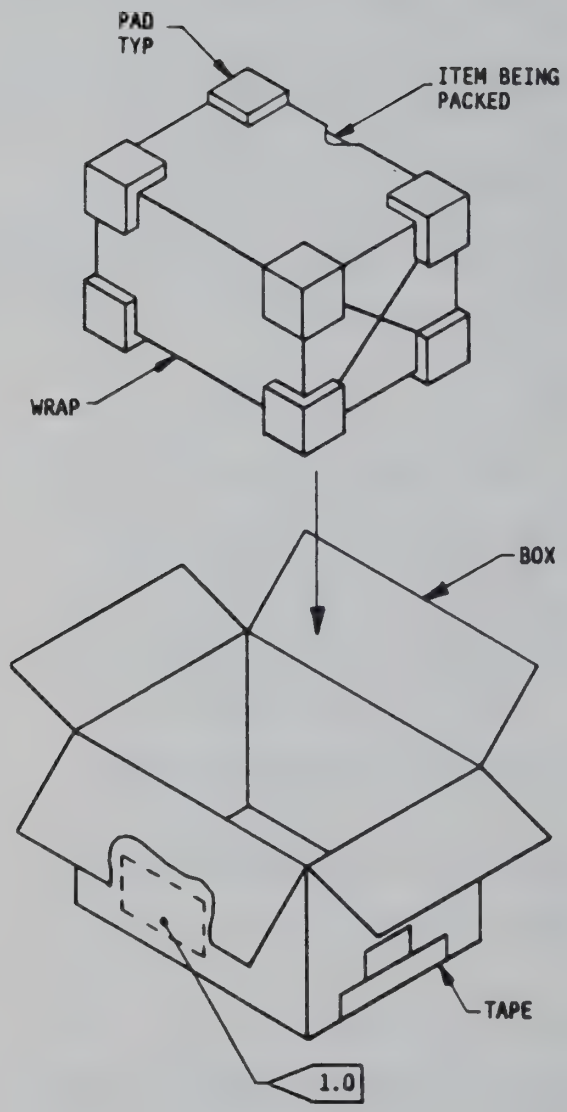
a. Solder two wires (previously removed) to input terminals on side of PS2.

b. Solder six wires (previously removed) to output terminals on side of PS2.

c. Apply silicone compound, per MIL-C-47113, Dow Corning 340 or equivalent, to mounting surface of PS2.

d. Apply sealant grade C, per table 2-1, to threads of four cross-tip screws. Secure PS2 to mount with four cross-tip screws.

e. Replace top cover, refer to top cover installation procedures.



NOTE

1.0 MARKING TO BE APPLIED IN ACCORDANCE WITH MIL-STD-129 AND CONTRACTUAL REQUIREMENTS.

URC102-30
REF MX DWG NO. 788473

Figure 6-3. Mounting Base Packaging Diagram

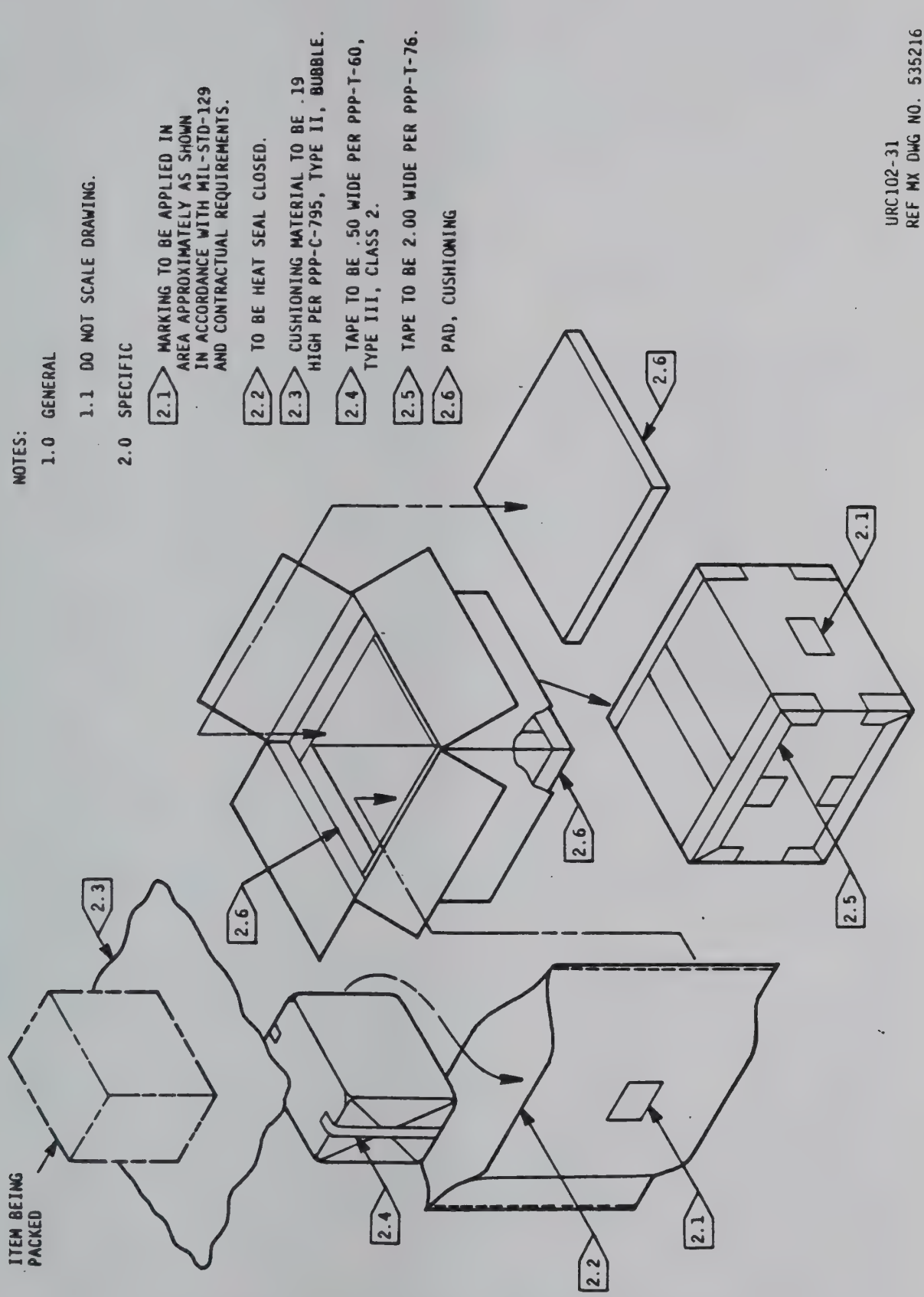

NOTES:
1.0 GENERAL
1.1 DO NOT SCALE DRAWING.
2.0 SPECIFIC
2.1 MARKING TO BE APPLIED IN AREA APPROXIMATELY AS SHOWN IN ACCORDANCE WITH MIL-STD-129 AND CONTRACTUAL REQUIREMENTS.
2.2 TO BE HEAT SEAL CLOSED.
2.3 CUSHIONING MATERIAL TO BE .19 HIGH PER PPP-C-795, TYPE II, BUBBLE.
2.4 TAPE TO BE .50 WIDE PER PPP-T-60, TYPE III, CLASS 2.
2.5 TAPE TO BE 2.00 WIDE PER PPP-T-76.
2.6 PAD, CUSHIONING
URC102-31
REF MX DWG NO. 535216
ITEM BEING PACKED
2.1
2.2
2.3
2.4
2.5
2.6

Figure 6-4. Oscillator Packaging Diagram

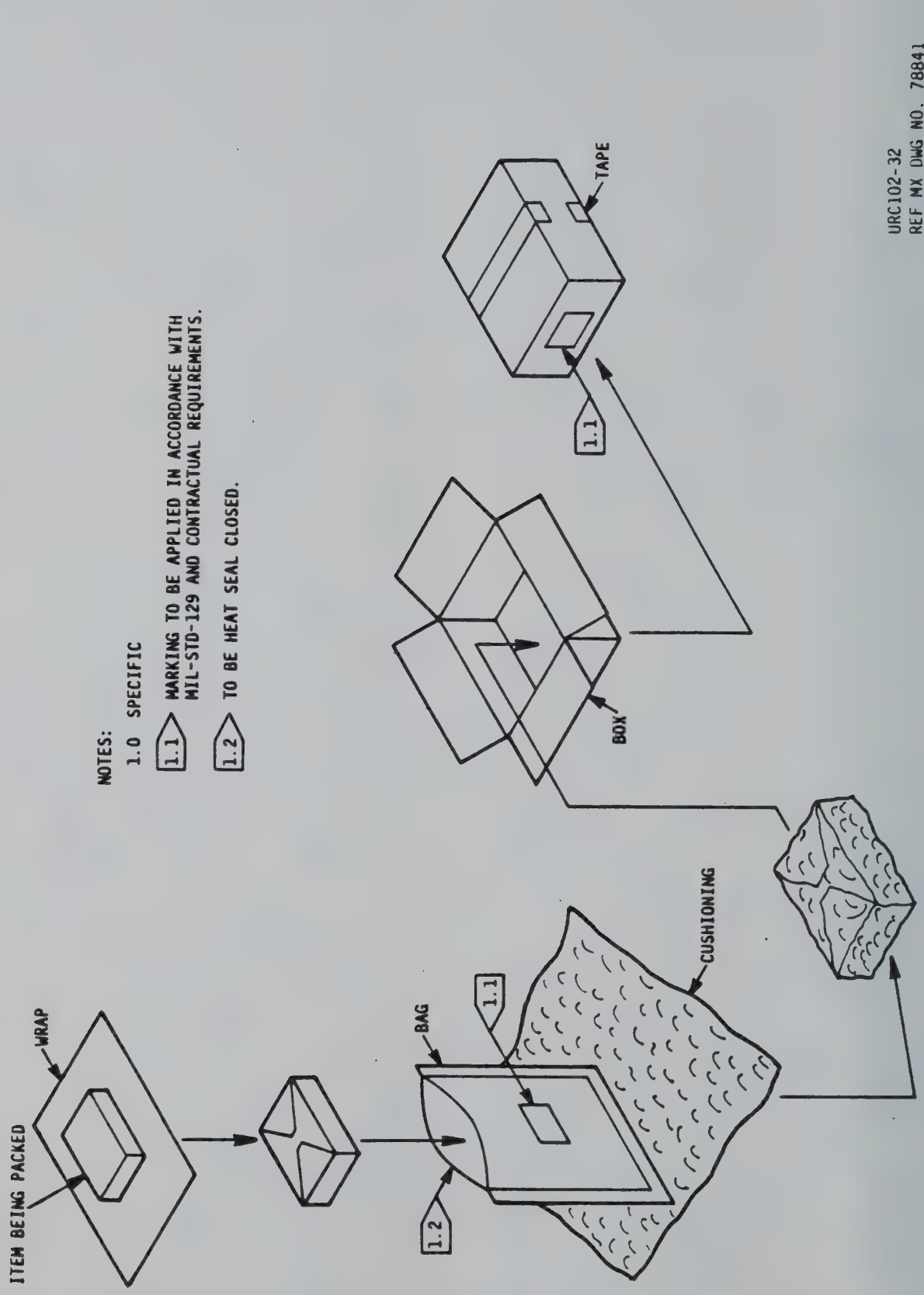


Figure 6-5. Divider/Audio Board Packaging Diagram

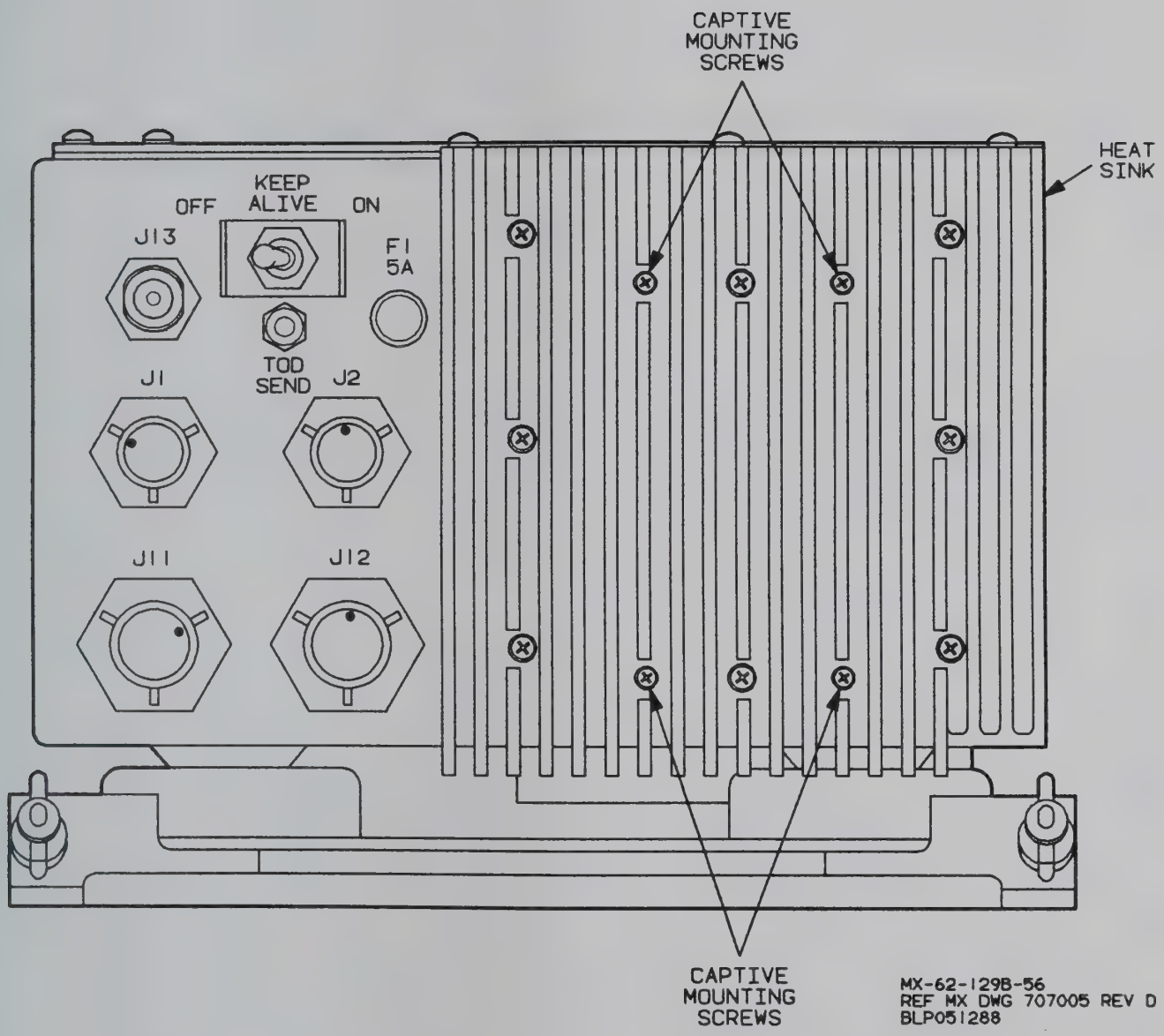
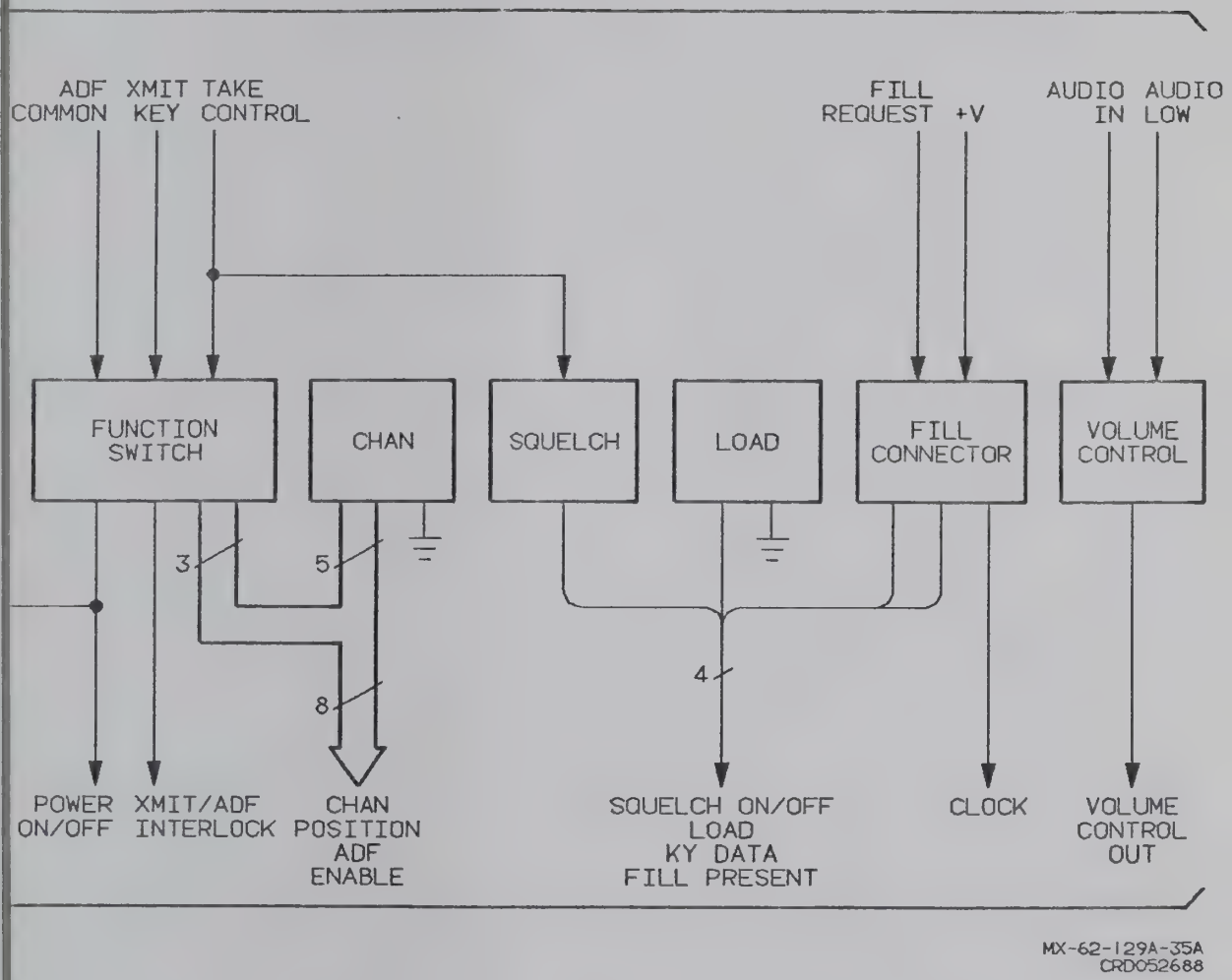
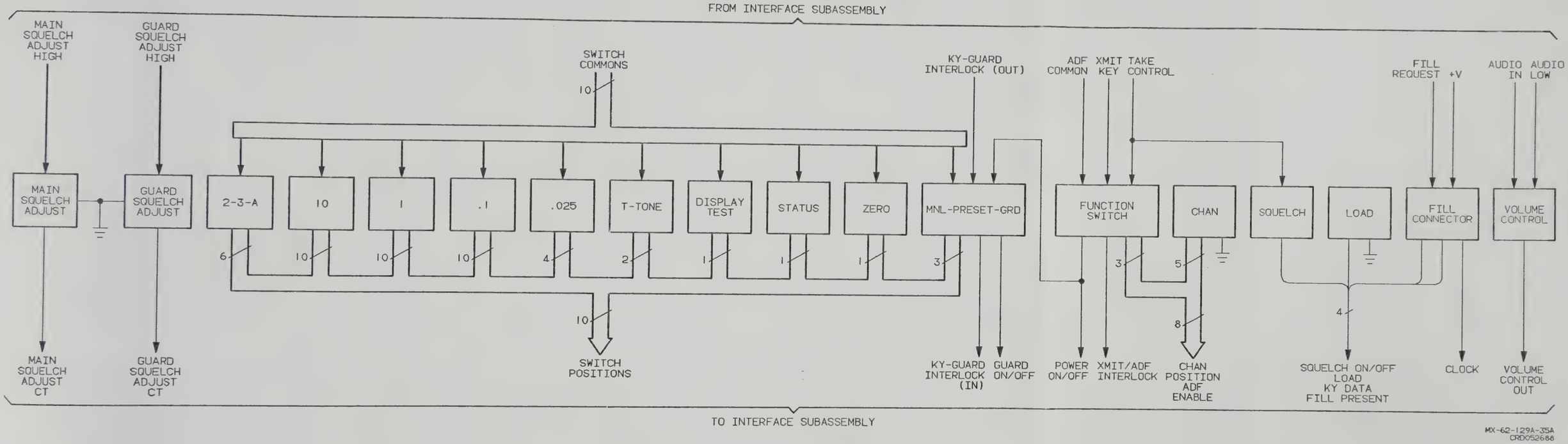


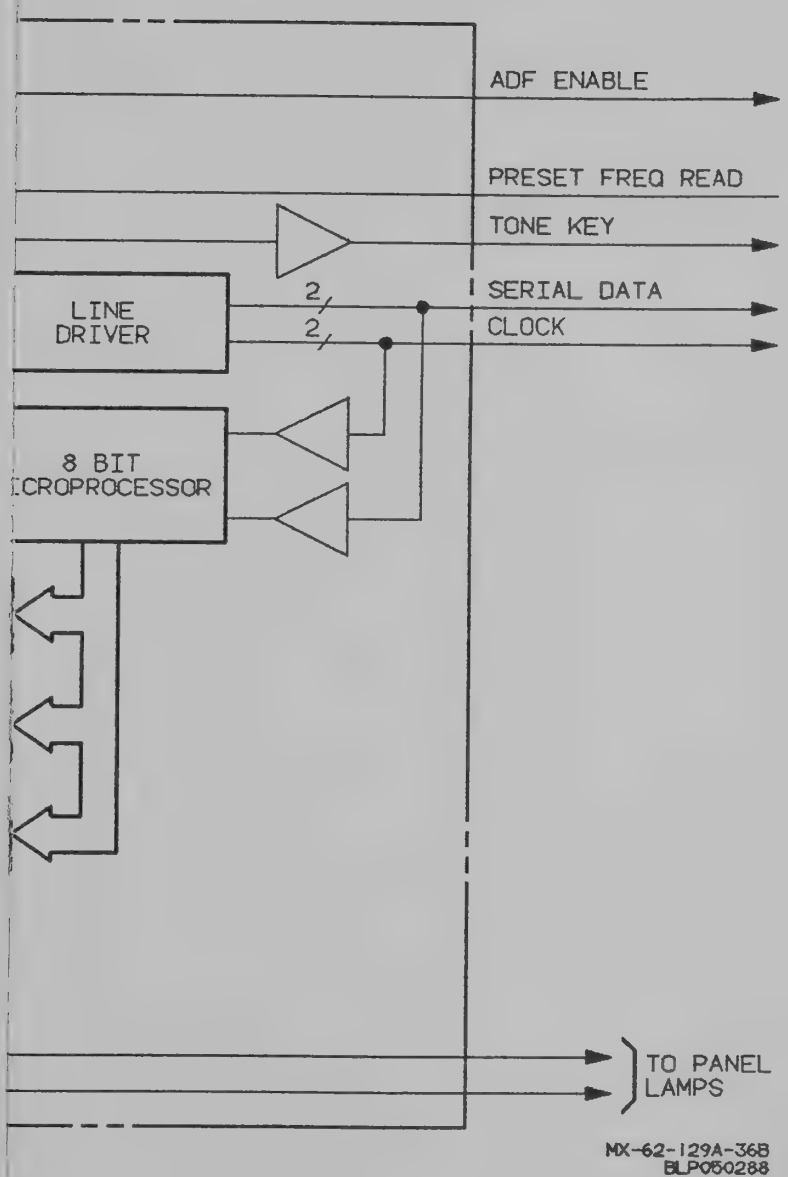
Figure 6-6. RT Removal



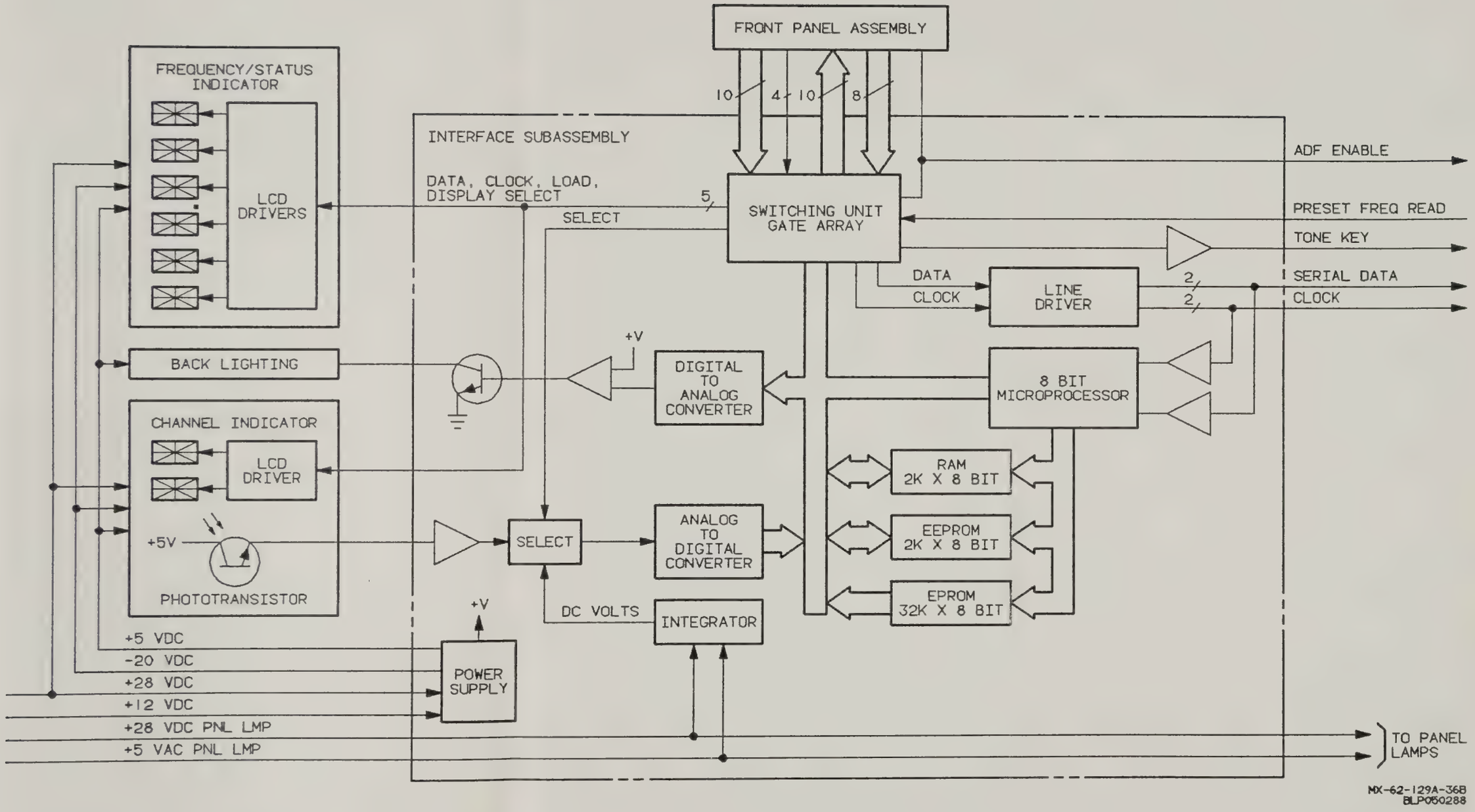
FO-1. Switching Unit Panel Assembly Block Diagram



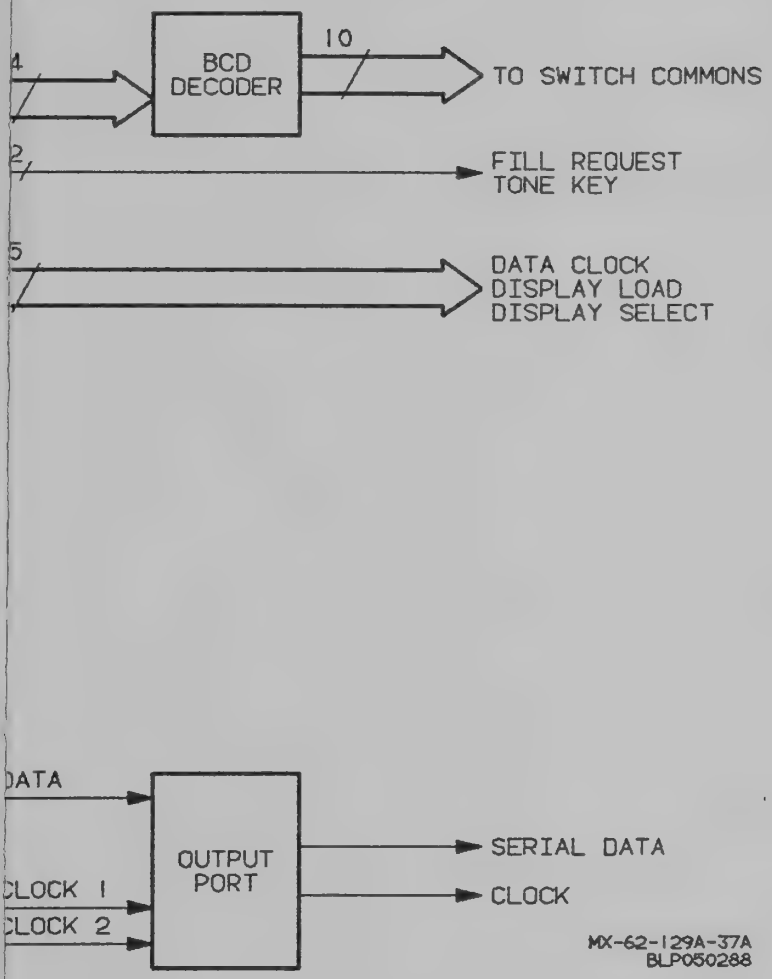
FO-1. Switching Unit Panel Assembly Block Diagram



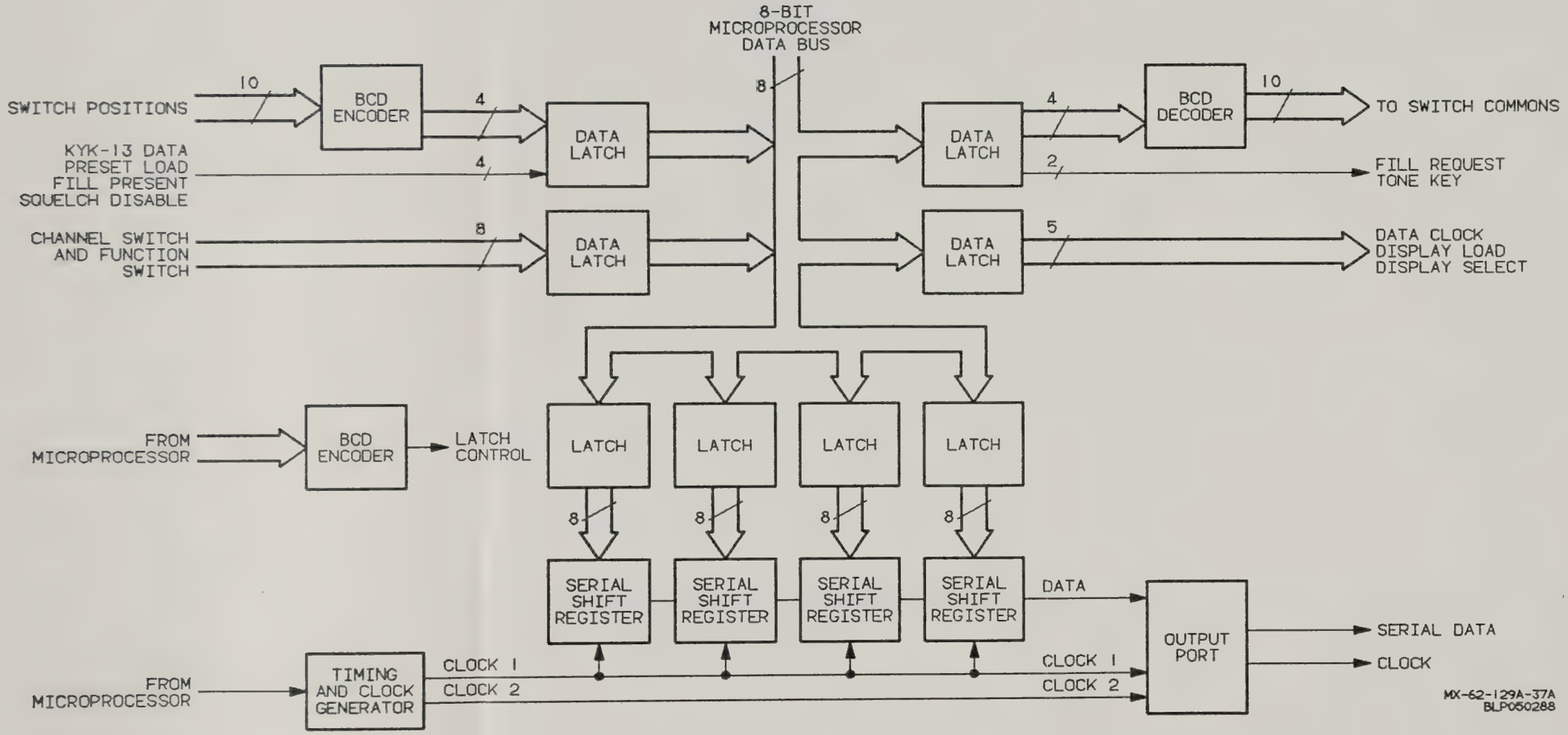
FO-2. Front Panel Interface CCA
Block Diagram



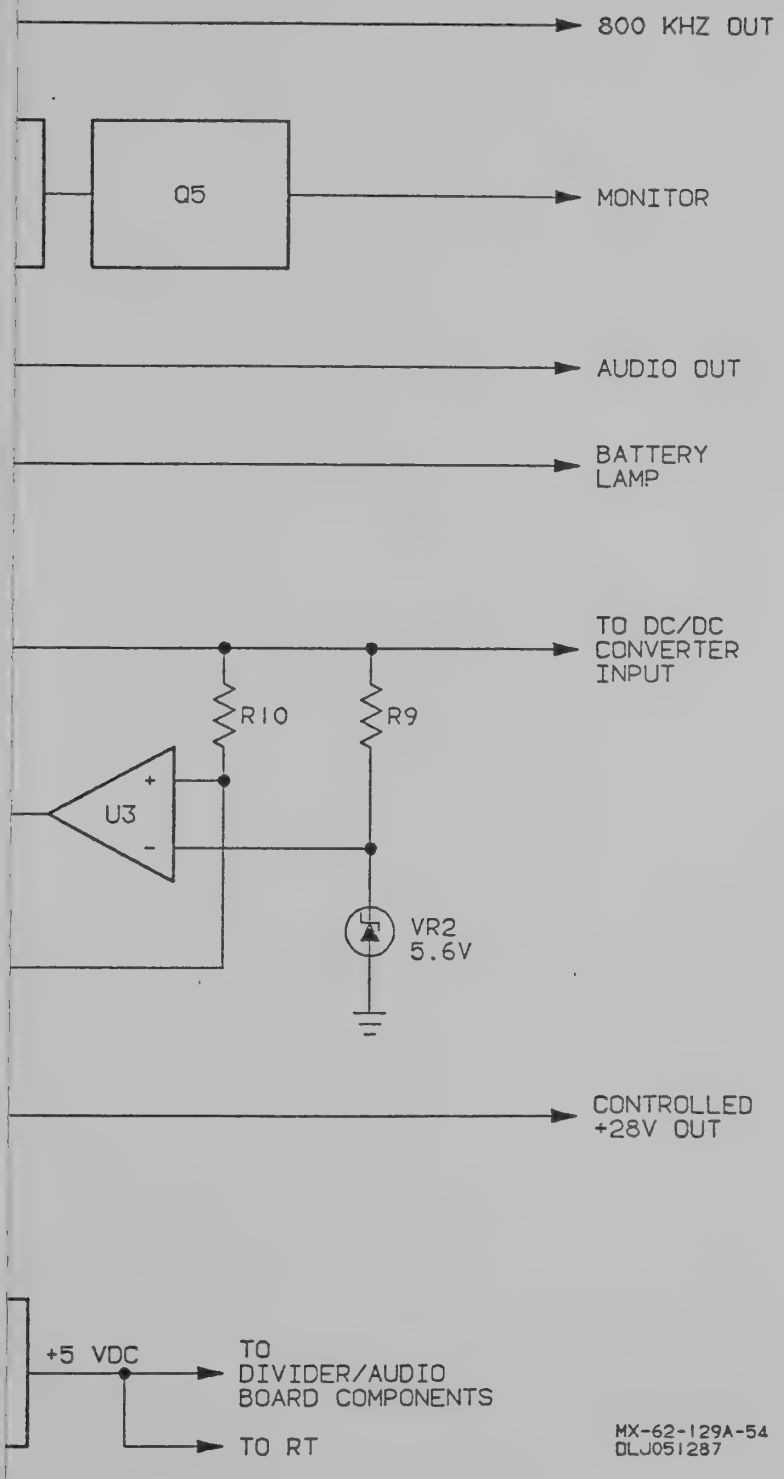
FO-2. Front Panel Interface CCA Block Diagram



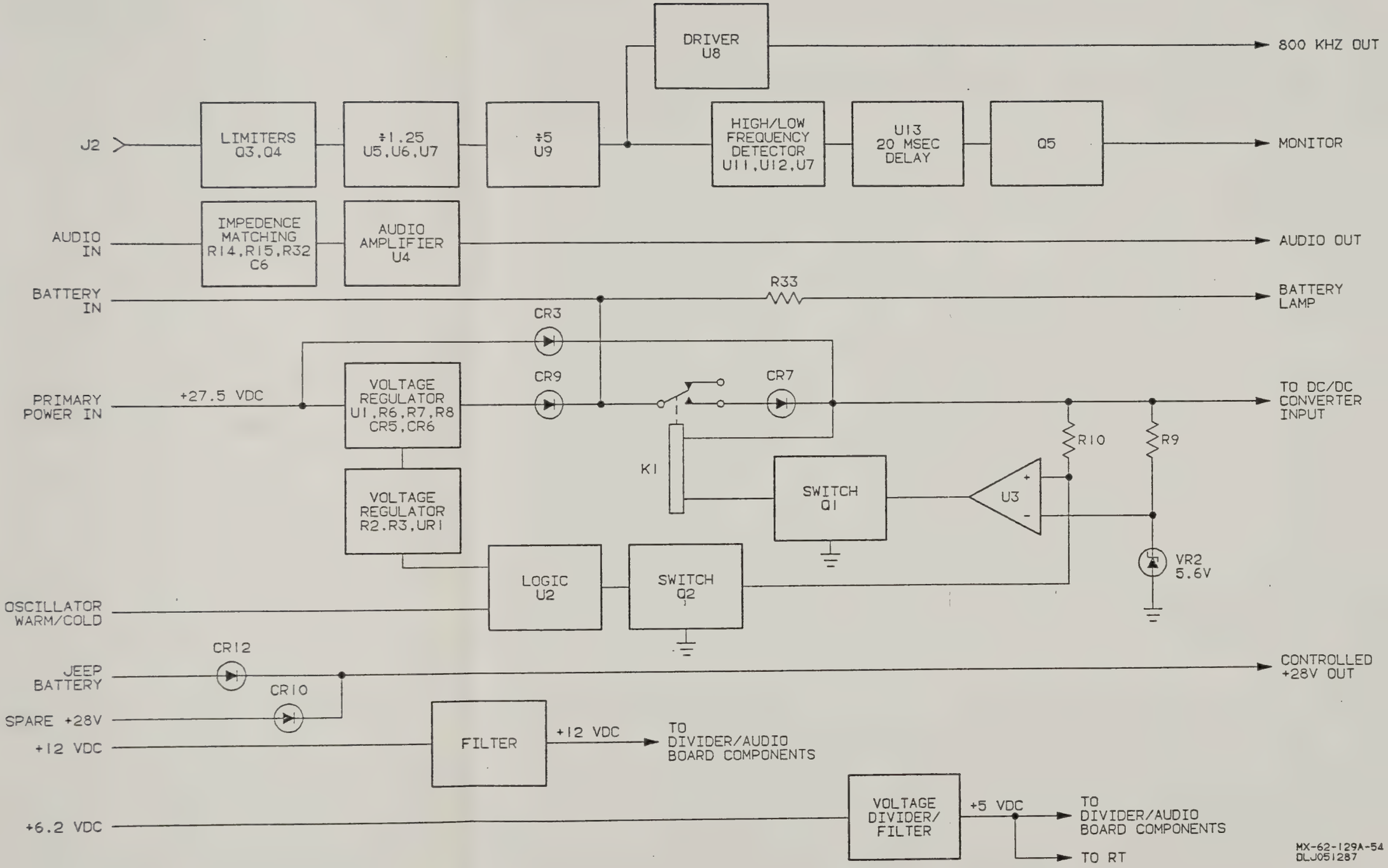
FO-3. Switching Unit Gate Array
Block Diagram



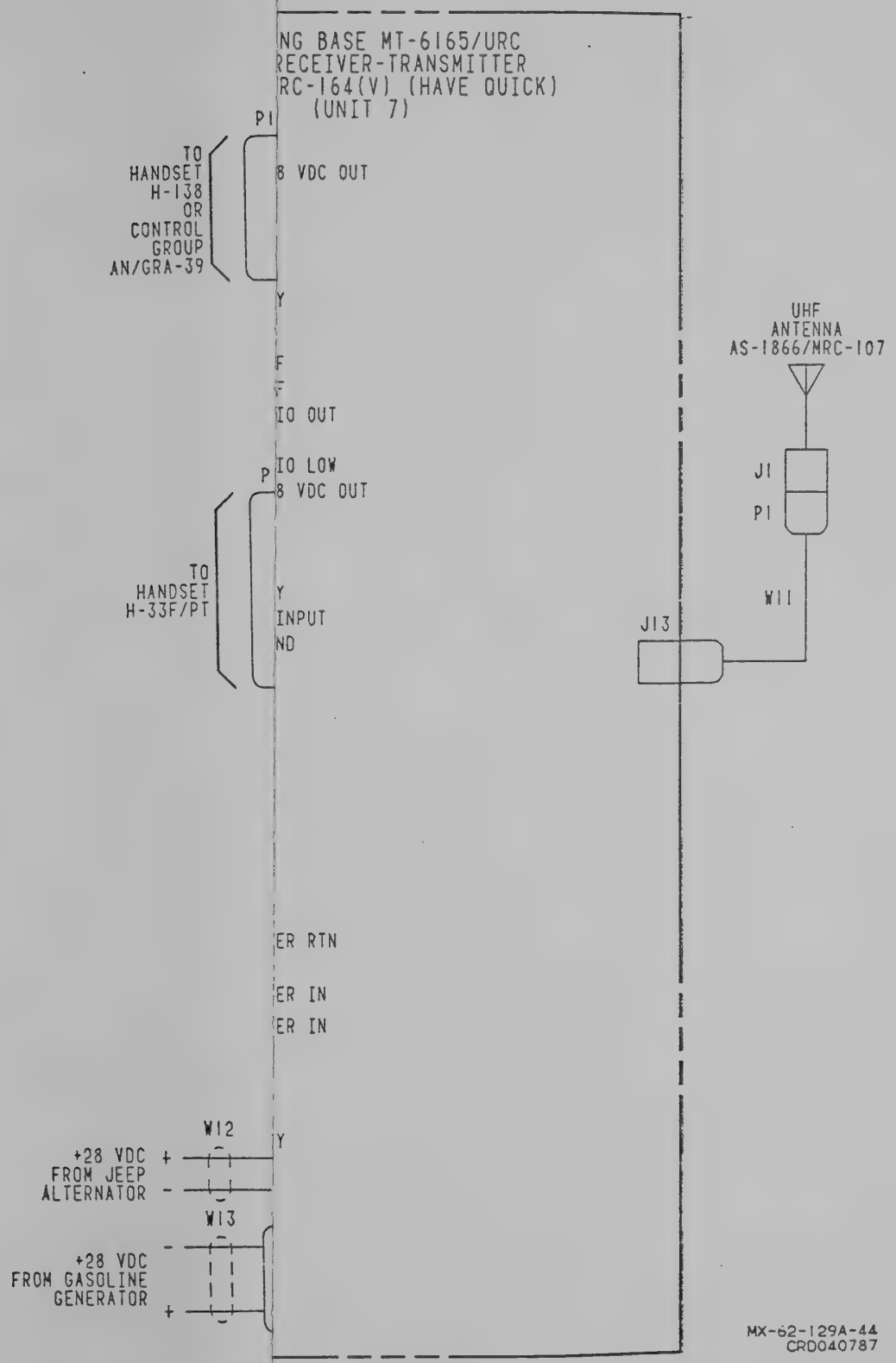
F0-3. Switching Unit Gate Array Block Diagram



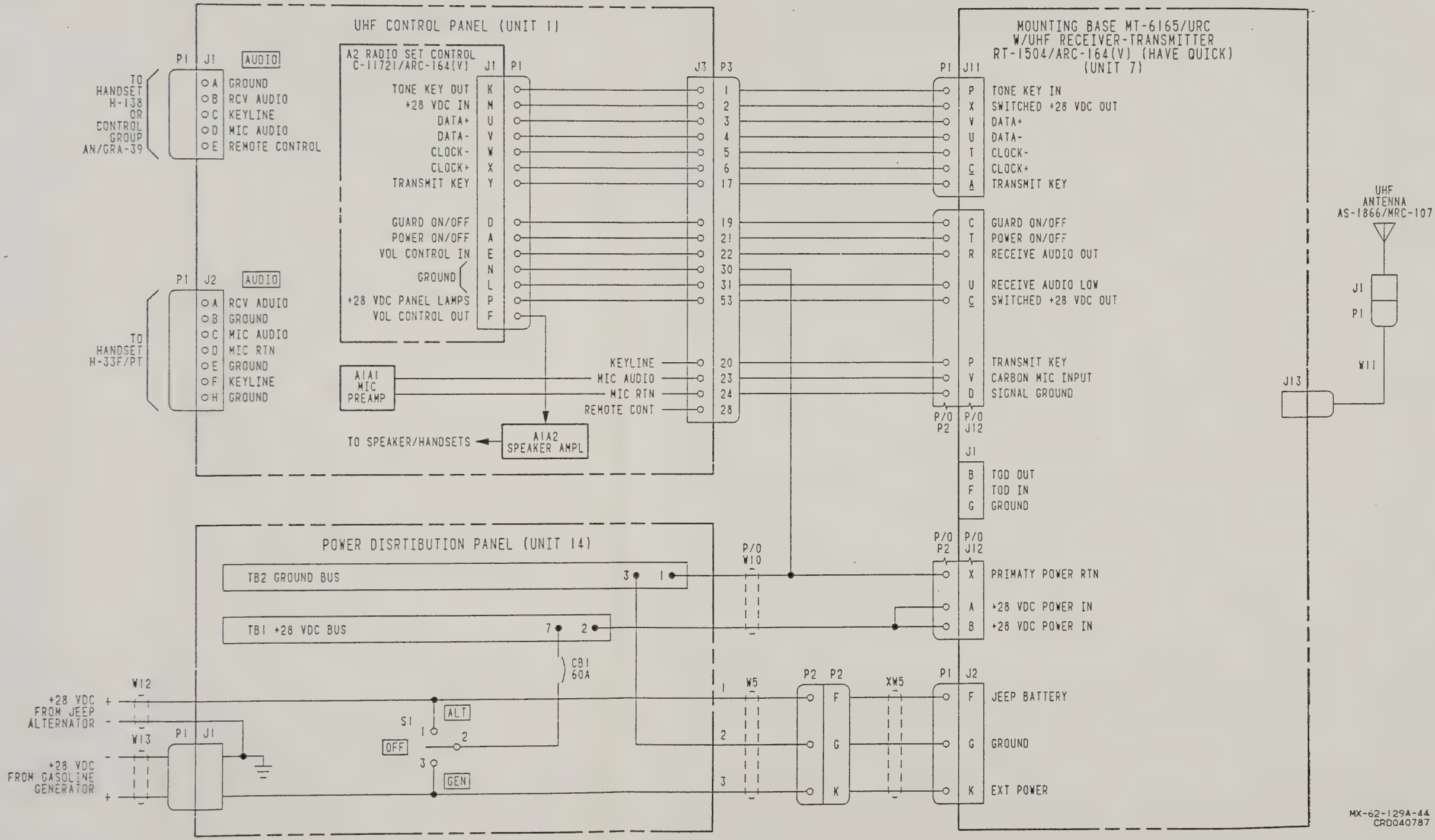
FO-4. Divider/Audio Board
Block Diagram



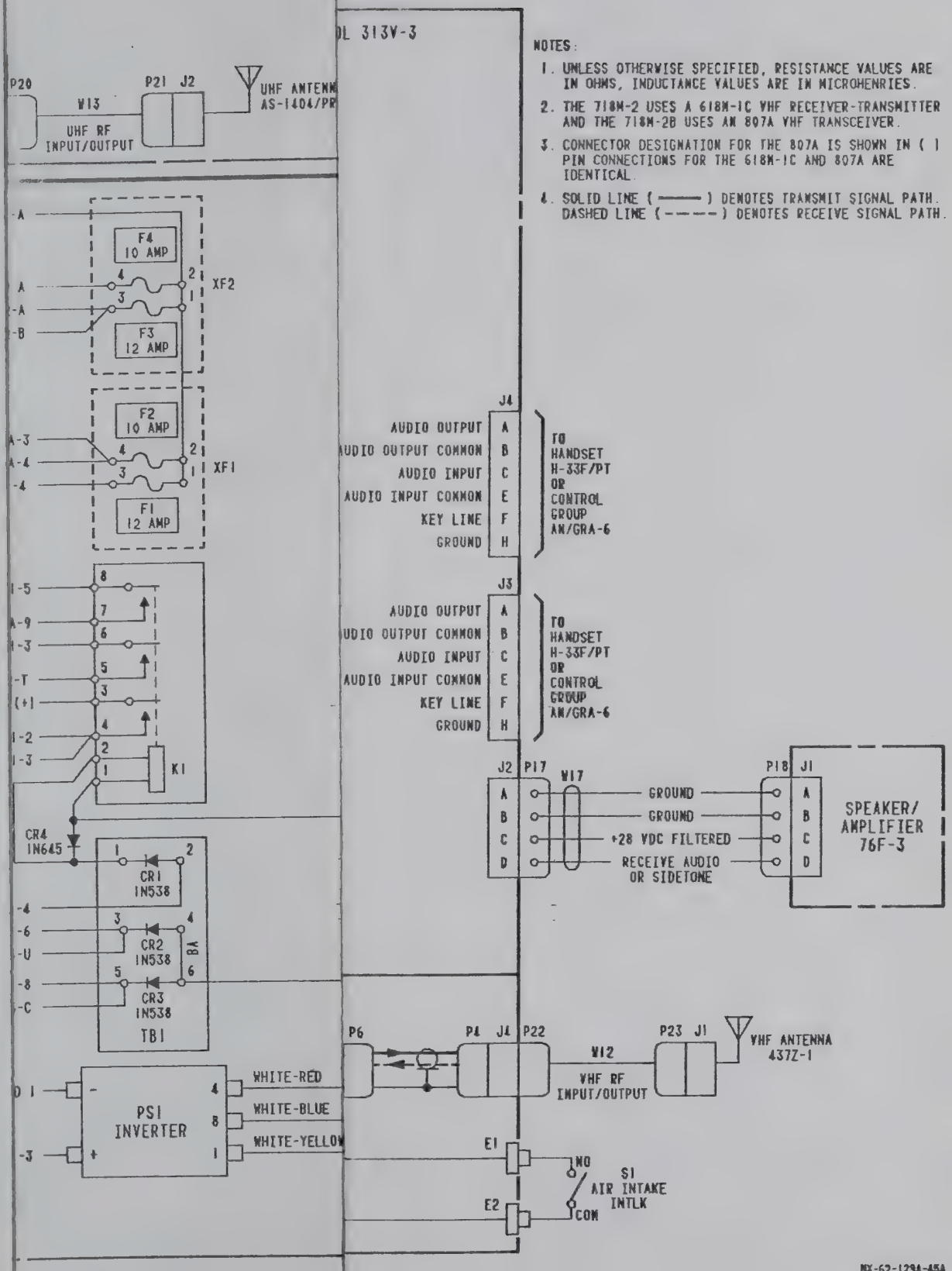
FO-4. Divider/Audio Board Block Diagram



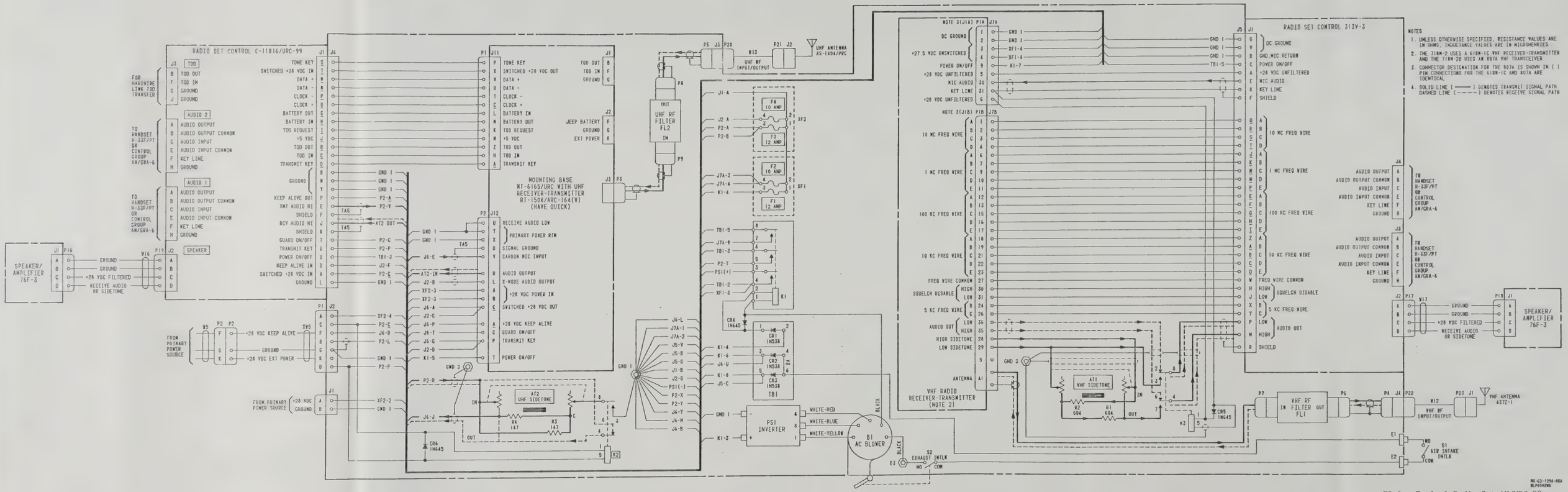
FO-5. Typical Radio Set AN/URC-98 Installation Diagram



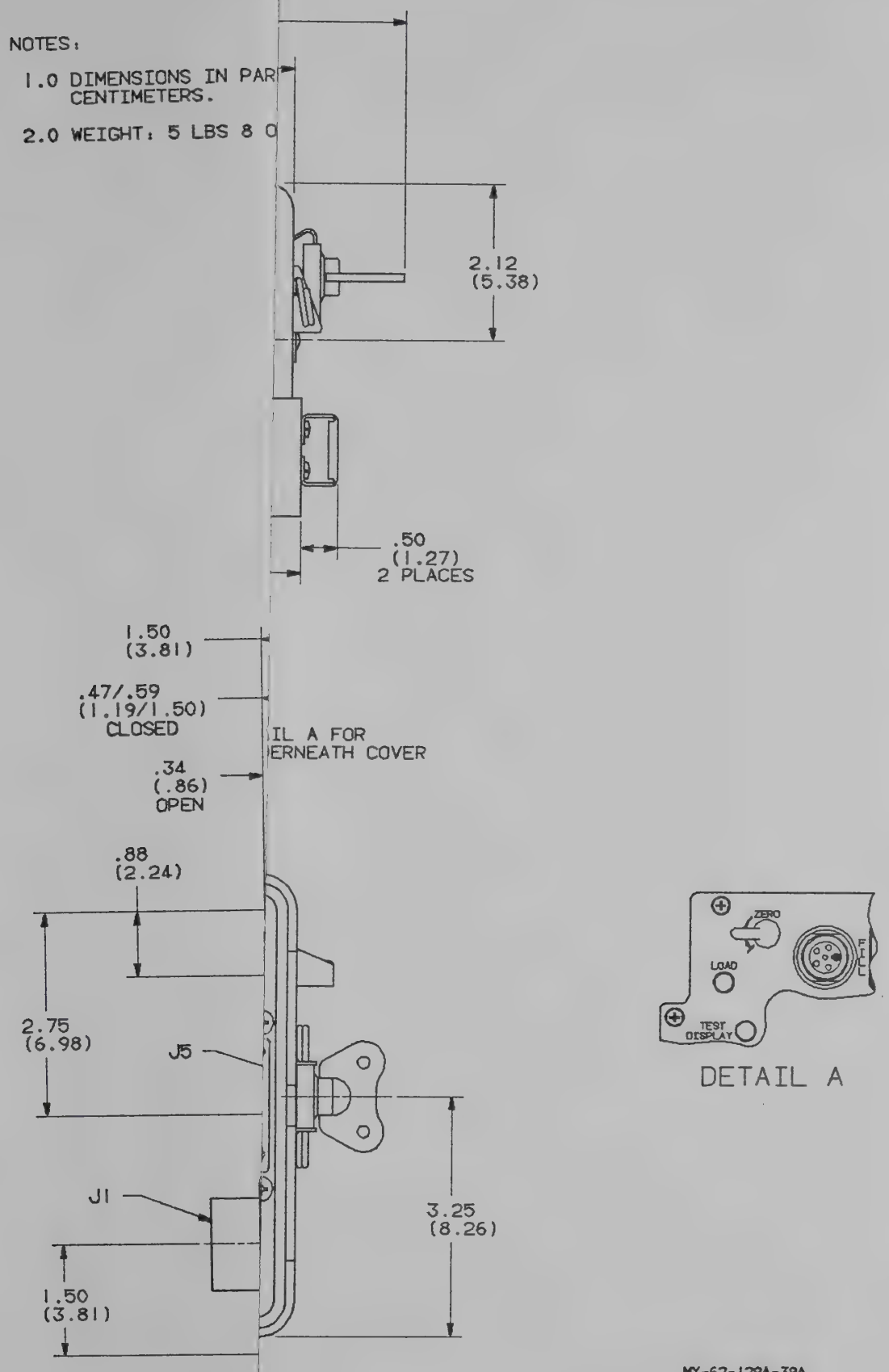
FO-5. Typical Radio Set AN/URC-98 Installation Diagram



FO-6. Typical Radio Set AN/URC-99 Installation Diagram


RADIO SET CONTROL C-11816/URC-99
MOUNTING BASE MT-6165/URC WITH UHF RECEIVER-TRANSMITTER RT-1504/ARC-164(V) (HAVE QUICK)
UHF RF FILTER FL2
UHF ANTENNA AS-1404/PRC
SPEAKER/ AMPLIFIER 76F-3
PSI INVERTER
B1 AC BLOWER
VHF RADIO RECEIVER-TRANSMITTER (NOTE 2)
RADIO SET CONTROL 313V-3
VHF RF IN FILTER OUT FL1
VHF ANTENNA 437Z-1
AIR INTAKE INTLK
EXHAUST INTLK
FROM PRIMARY POWER SOURCE
NOTES
1. UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS; INDUCTANCE VALUES ARE IN MICROHENRIES
2. THE 318M-2 USES A 618M-1C VHF RECEIVER-TRANSMITTER AND THE 318M-2B USES AN 80TA VHF TRANSCEIVER.
3. CONNECTOR DESIGNATION FOR THE 80TA IS SHOWN IN ( ) PIN CONNECTIONS FOR THE 618M-1C AND 80TA ARE IDENTICAL
4. SOLID LINE (——) DENOTES TRANSMIT SIGNAL PATH DASHED LINE (– – –) DENOTES RECEIVE SIGNAL PATH

FO-6. Typical Radio Set AN/URC-99 Installation Diagram

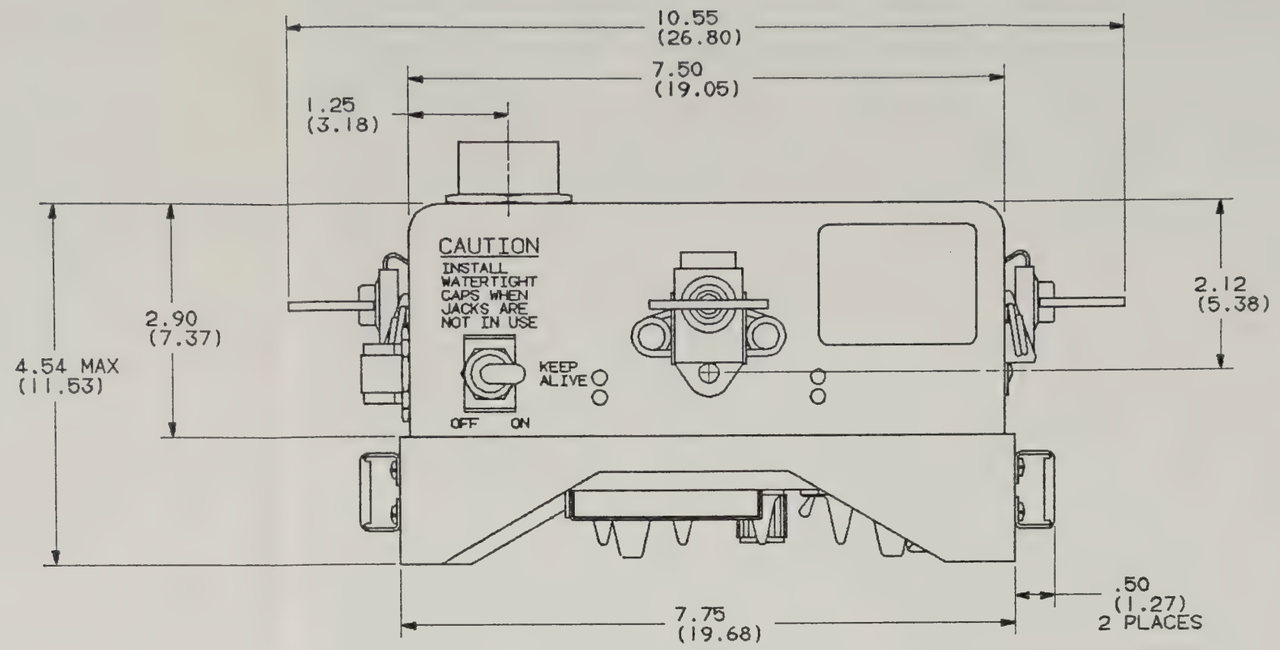


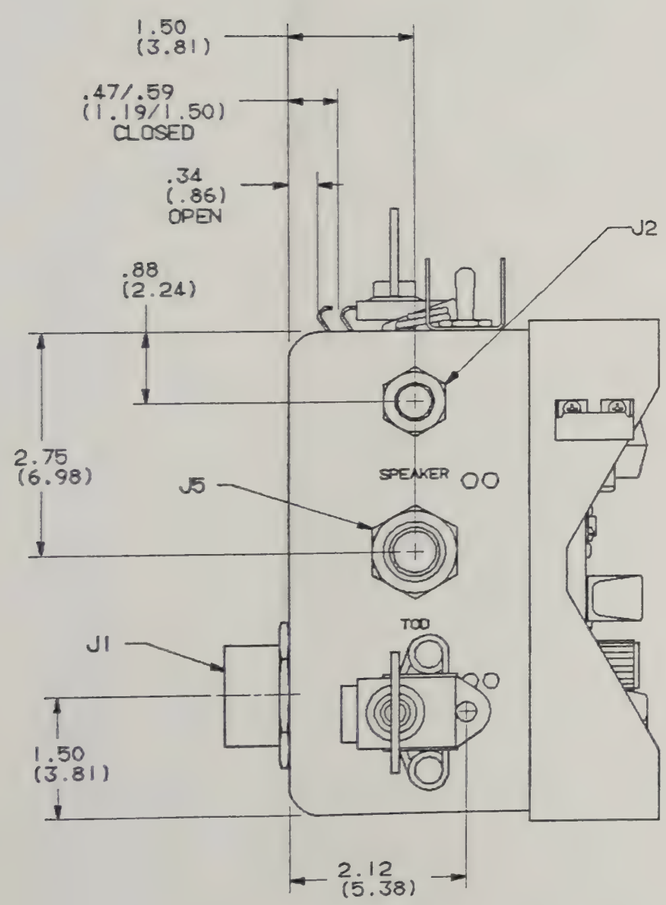
F0-7. Control C-11816 Outline Installation Drawing

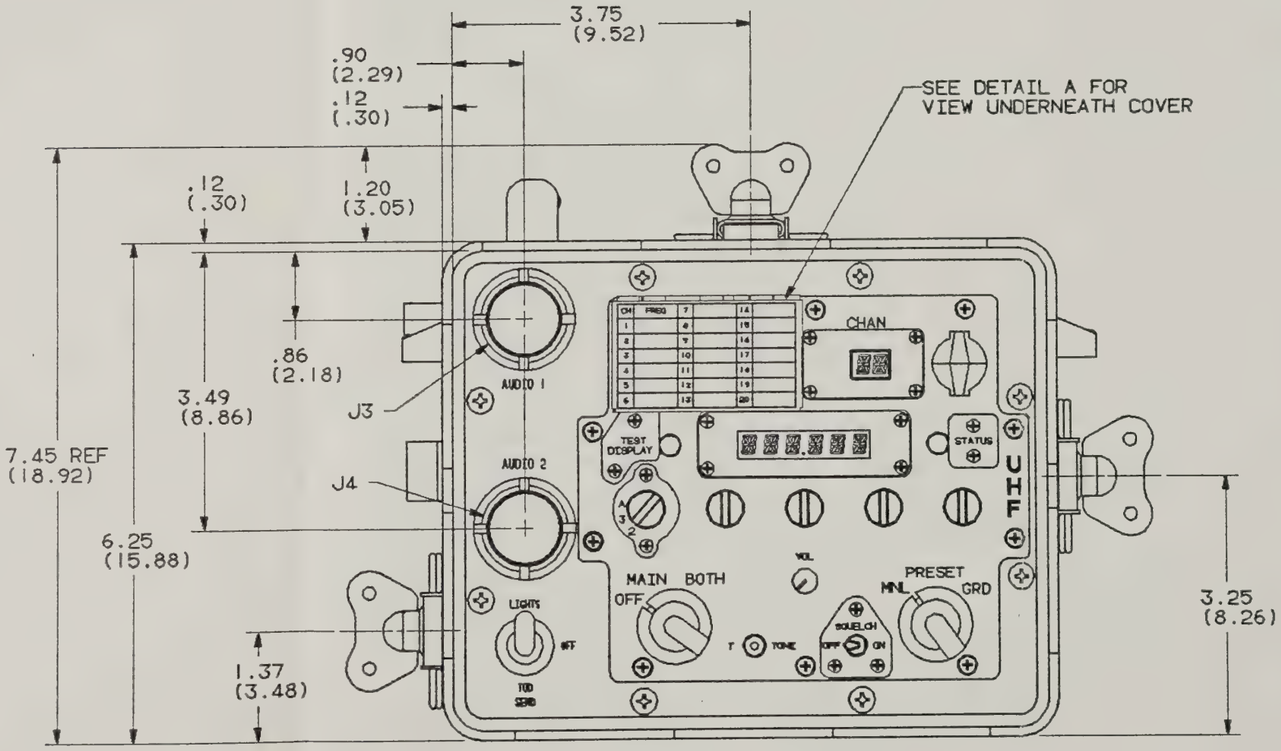
NOTES:

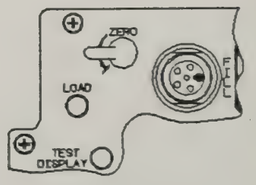
1.0 DIMENSIONS IN PARENTHESIS ARE IN CENTIMETERS.

2.0 WEIGHT: 5 LBS 8 OZ (2.49 KG).





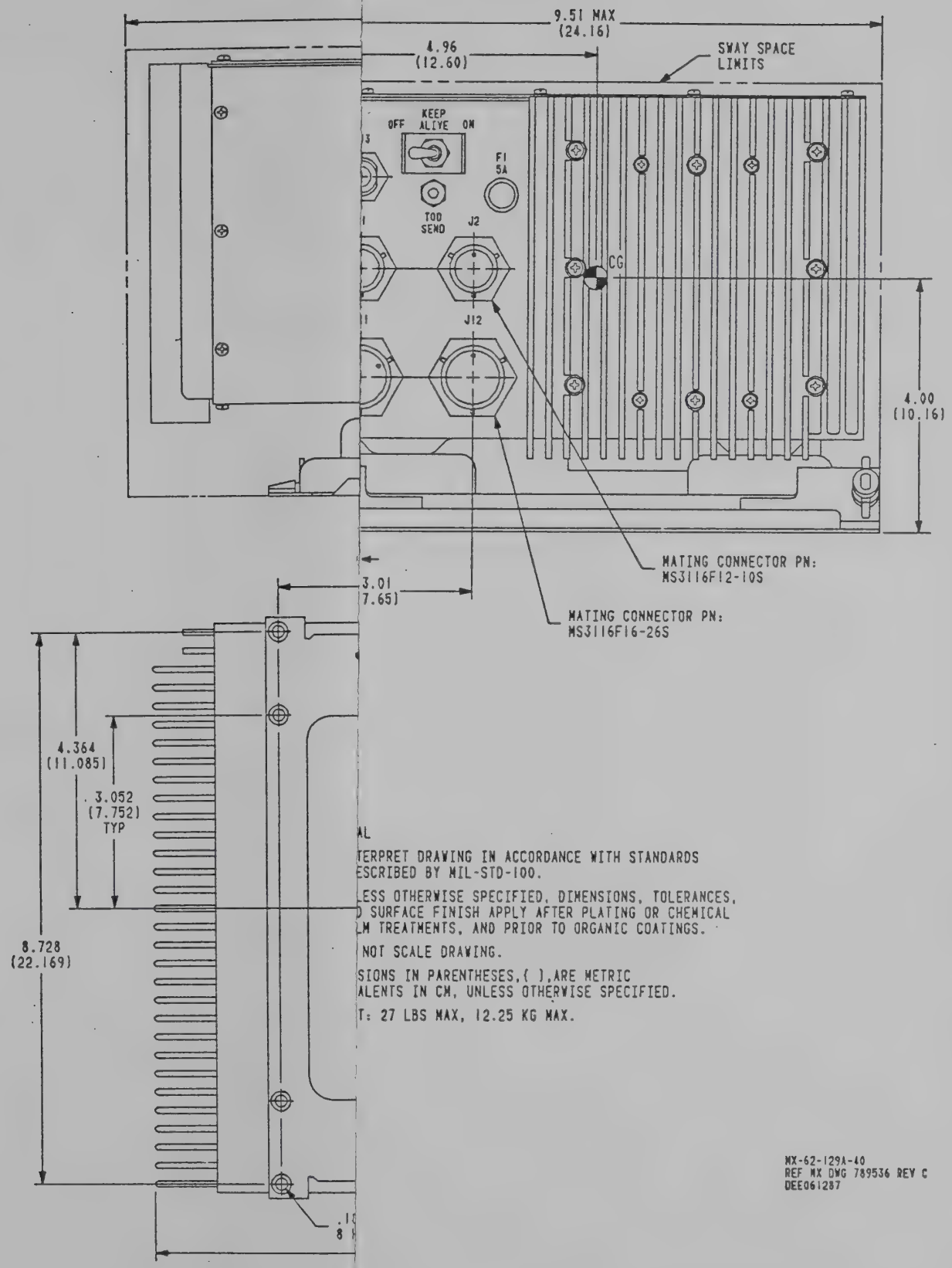




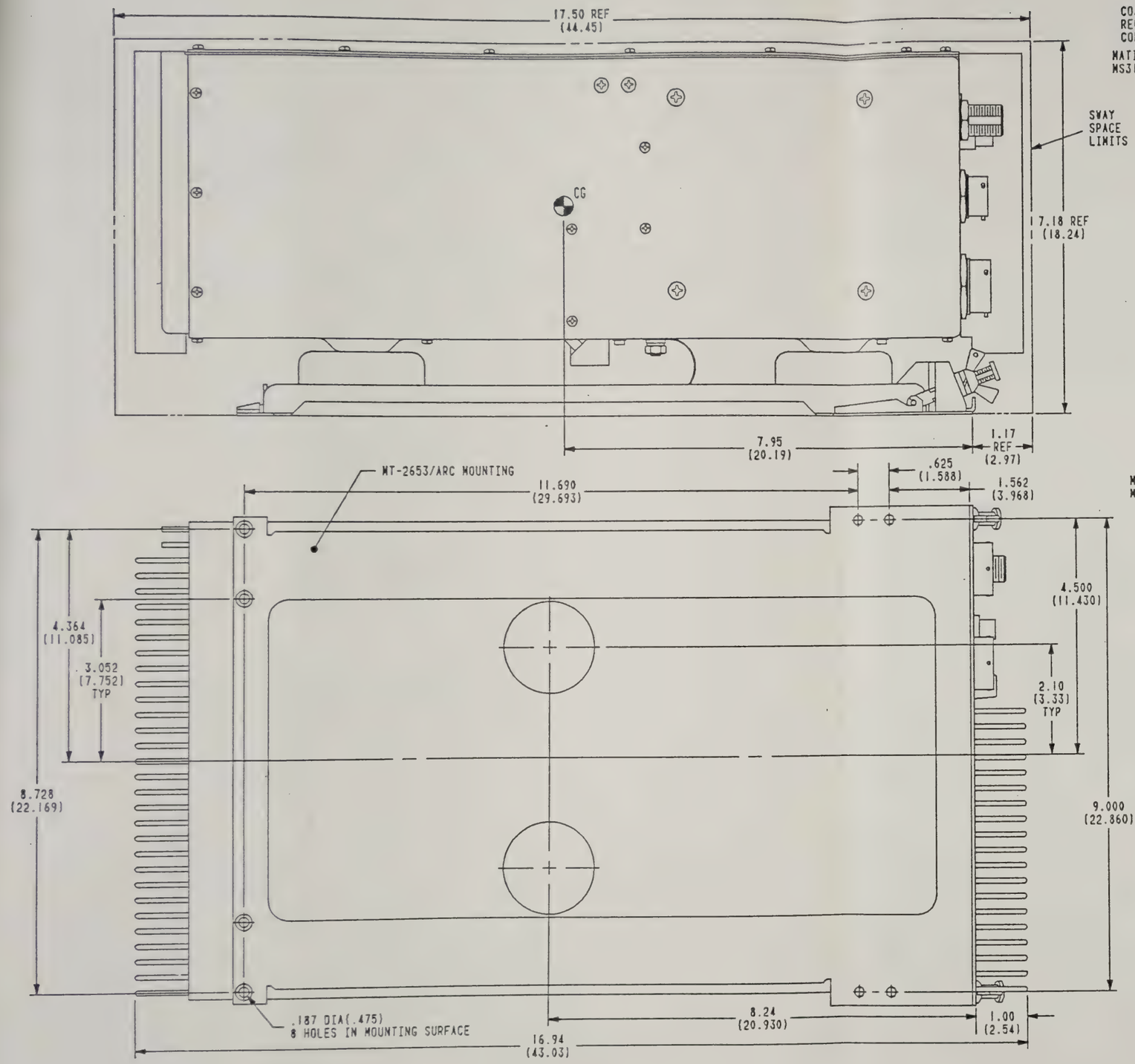
DETAIL A

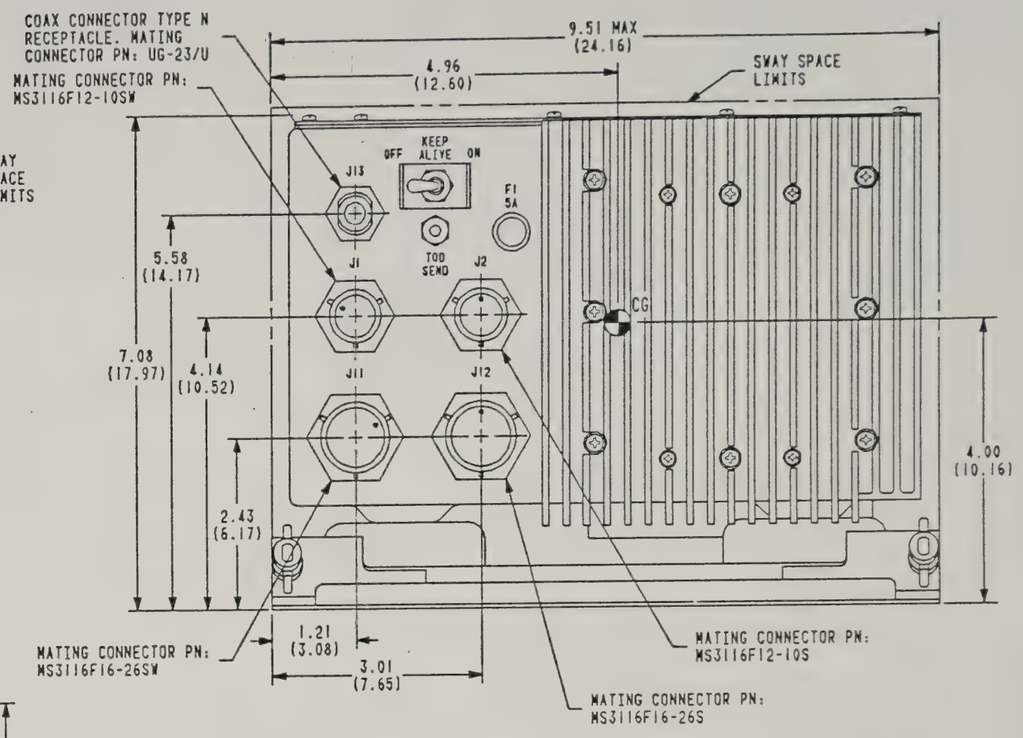
MX-62-129A-39A
REF MX DWG 480123 REV-
BLP050288

F0-7. Control C-11816 Outline Installation Drawing



FO-8. Mounting Base MT-6165 Outline Installation Drawing





NOTES:

1.0 GENERAL

1.1 INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-STD-100.

1.2 UNLESS OTHERWISE SPECIFIED, DIMENSIONS, TOLERANCES, AND SURFACE FINISH APPLY AFTER PLATING OR CHEMICAL FILM TREATMENTS, AND PRIOR TO ORGANIC COATINGS.

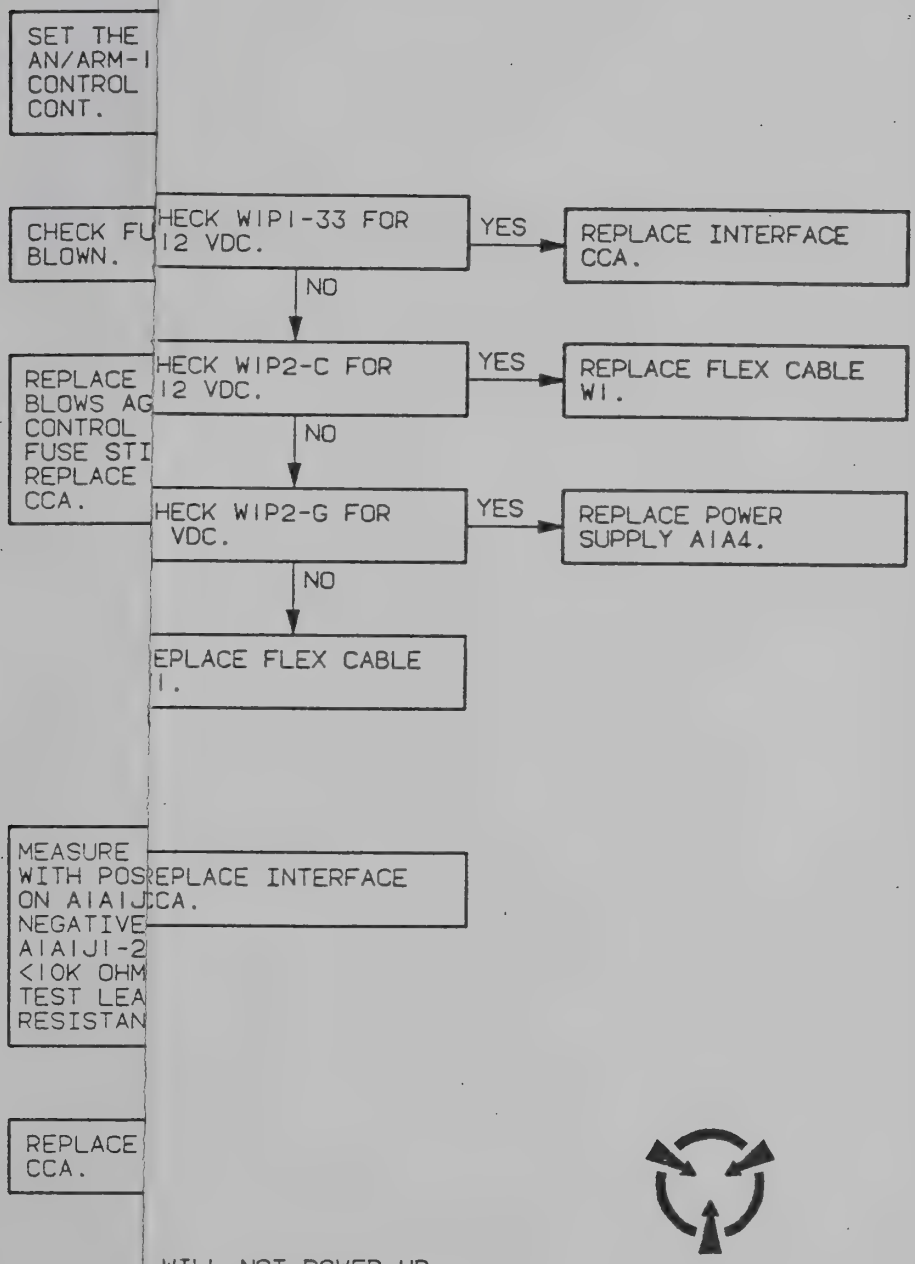
1.3 DO NOT SCALE DRAWING.

2.0 DIMENSIONS IN PARENTHESES,( ),ARE METRIC EQUIVALENTS IN CM, UNLESS OTHERWISE SPECIFIED.

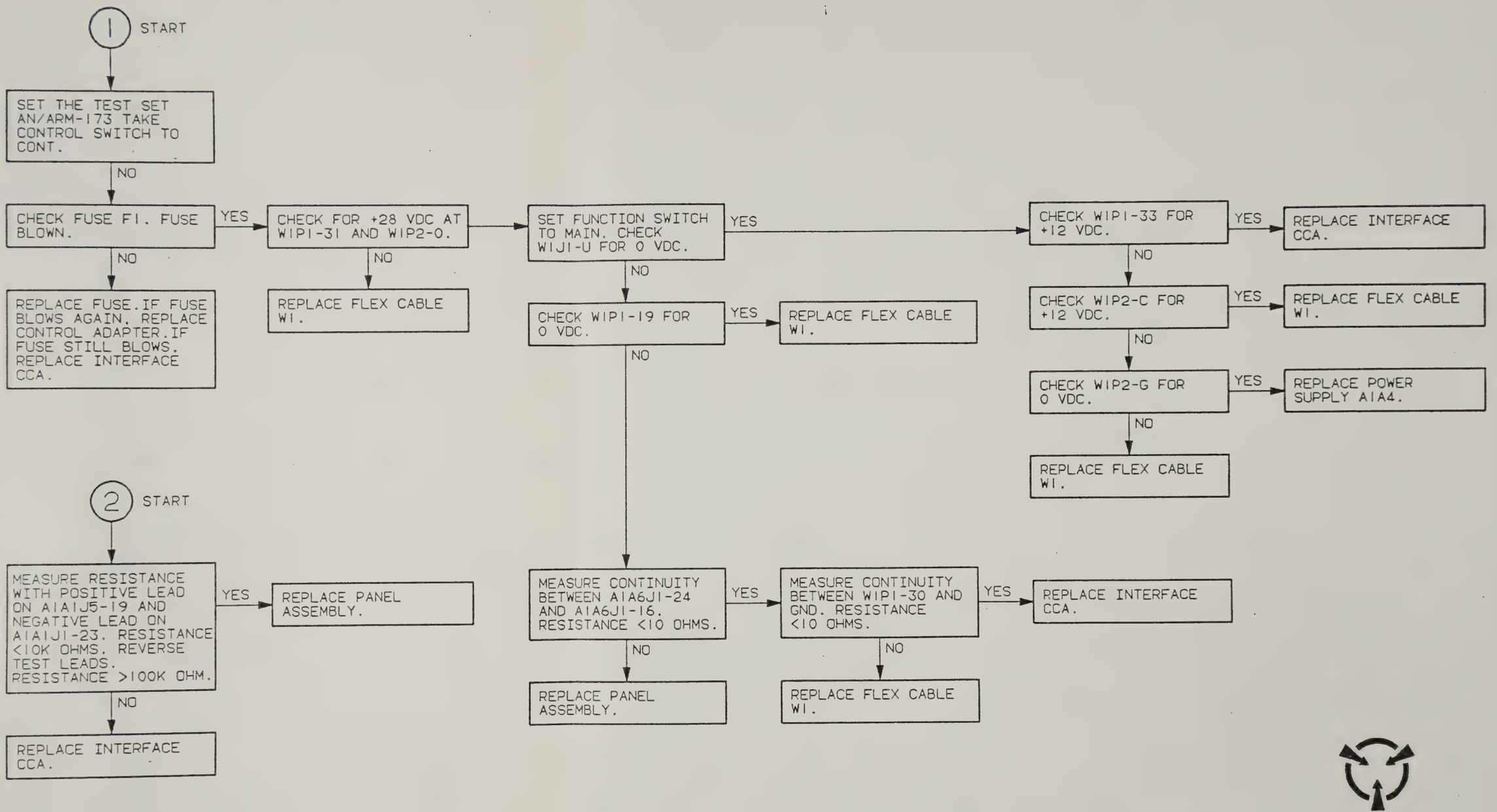
3.0 WEIGHT: 27 LBS MAX, 12.25 KG MAX.

MX-62-129A-40
REF MX DWG 789536 REV C
DEE061287

FO-8. Mounting Base MT-6165 Outline Installation Drawing



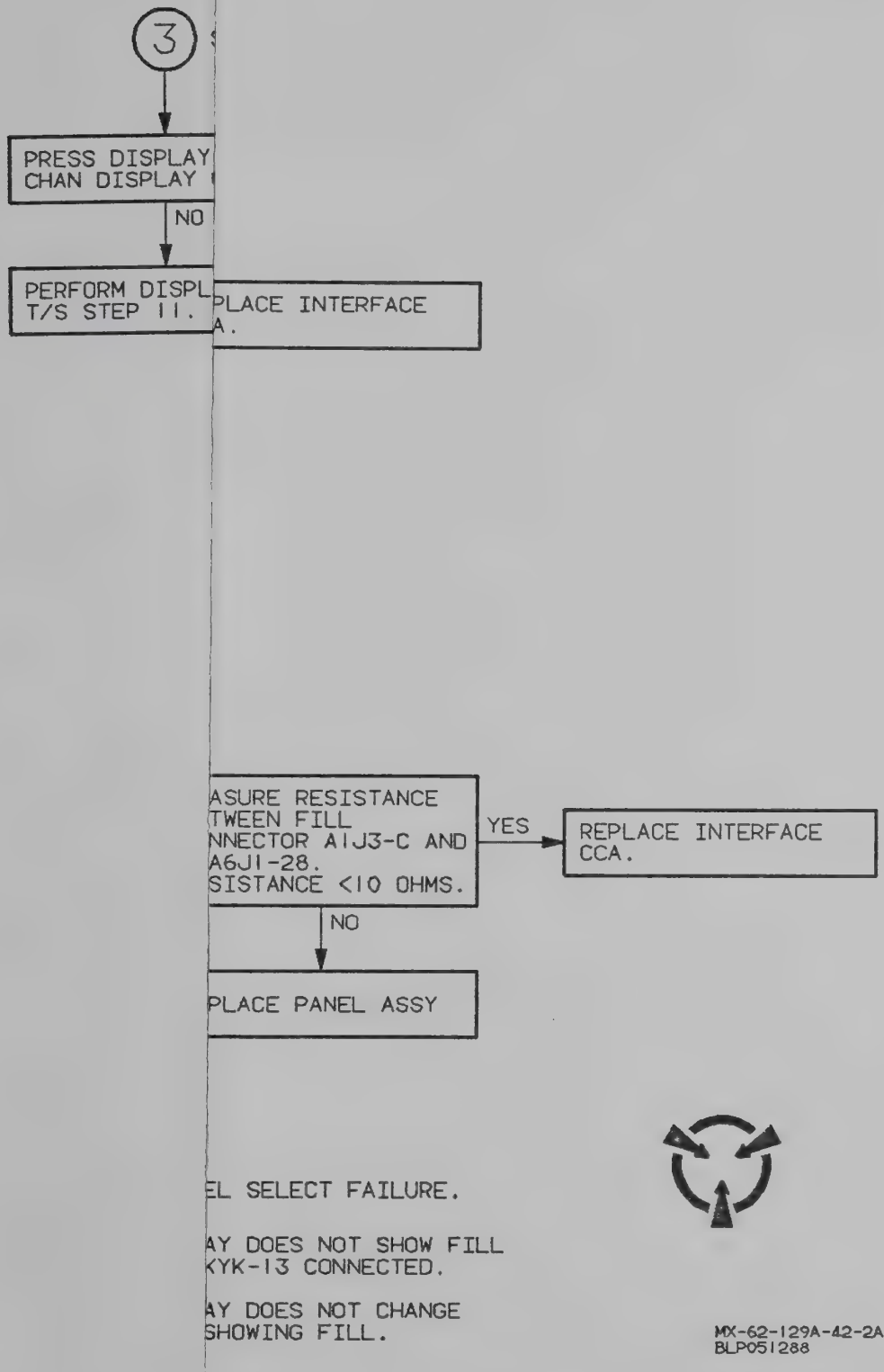
FO-9. Control C-11816 Trouble Analysis (Sheet 1 of 7)



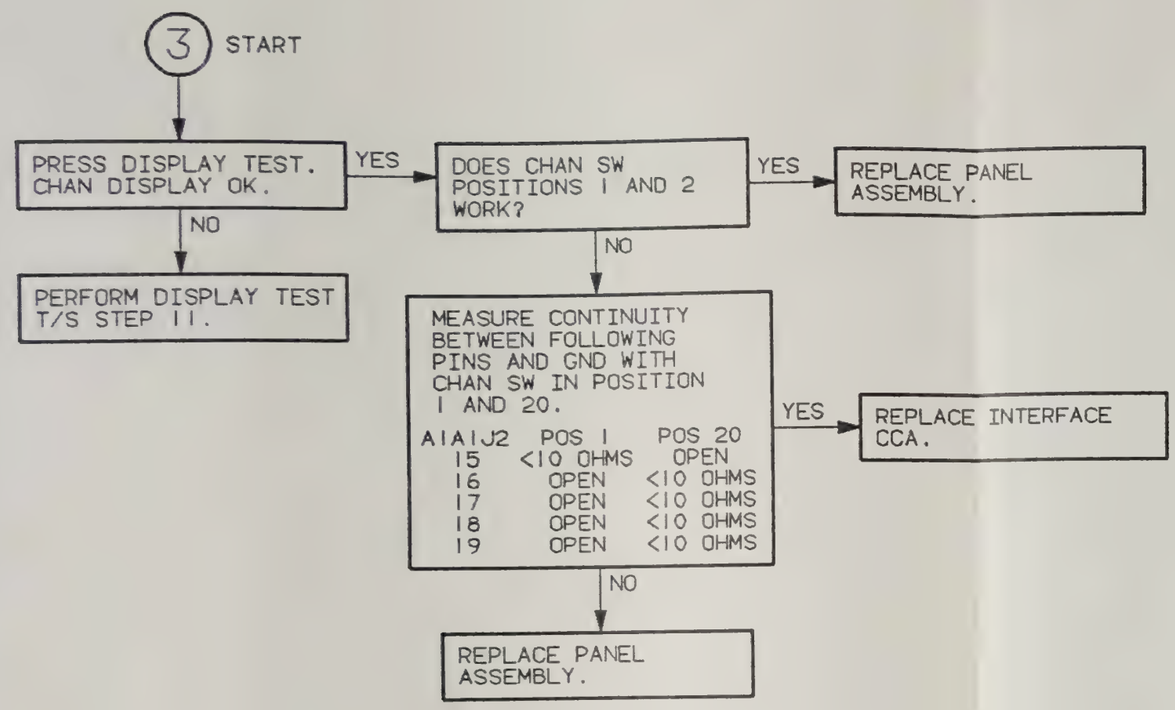
1. UNIT WILL NOT POWER-UP.
2. UNIT POWERS-UP IN MAIN POSITION OF FUNCTION SWITCH BUT NOT IN BOTH POSITION.

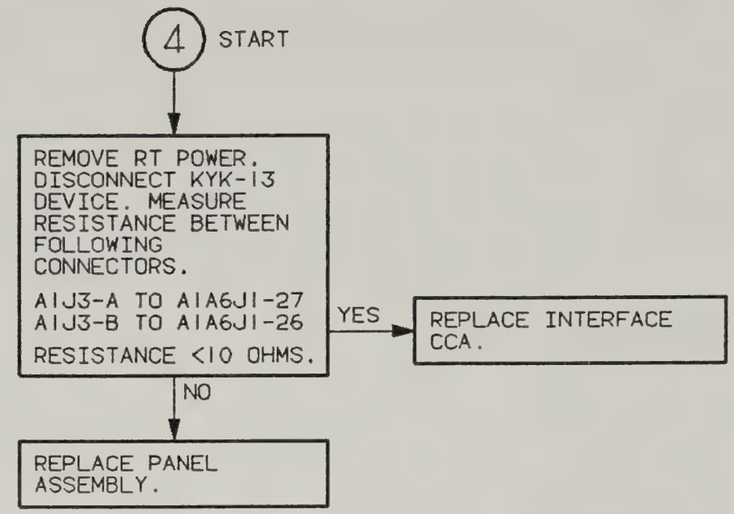
MX-62-129A-42-1
DLJ012287

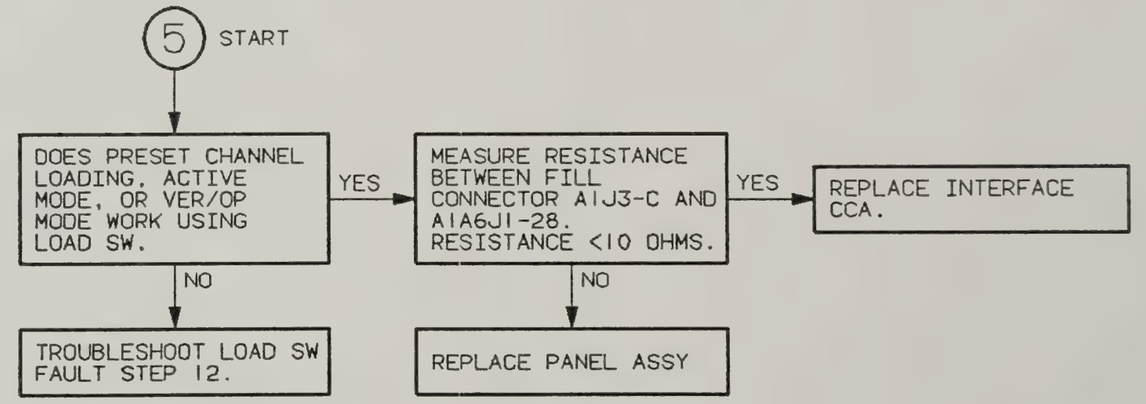
F0-9. Control C-11816 Trouble Analysis (Sheet 1 of 7)



FO-9. Control C-11816 Trouble Analysis (Sheet 2 of 7)







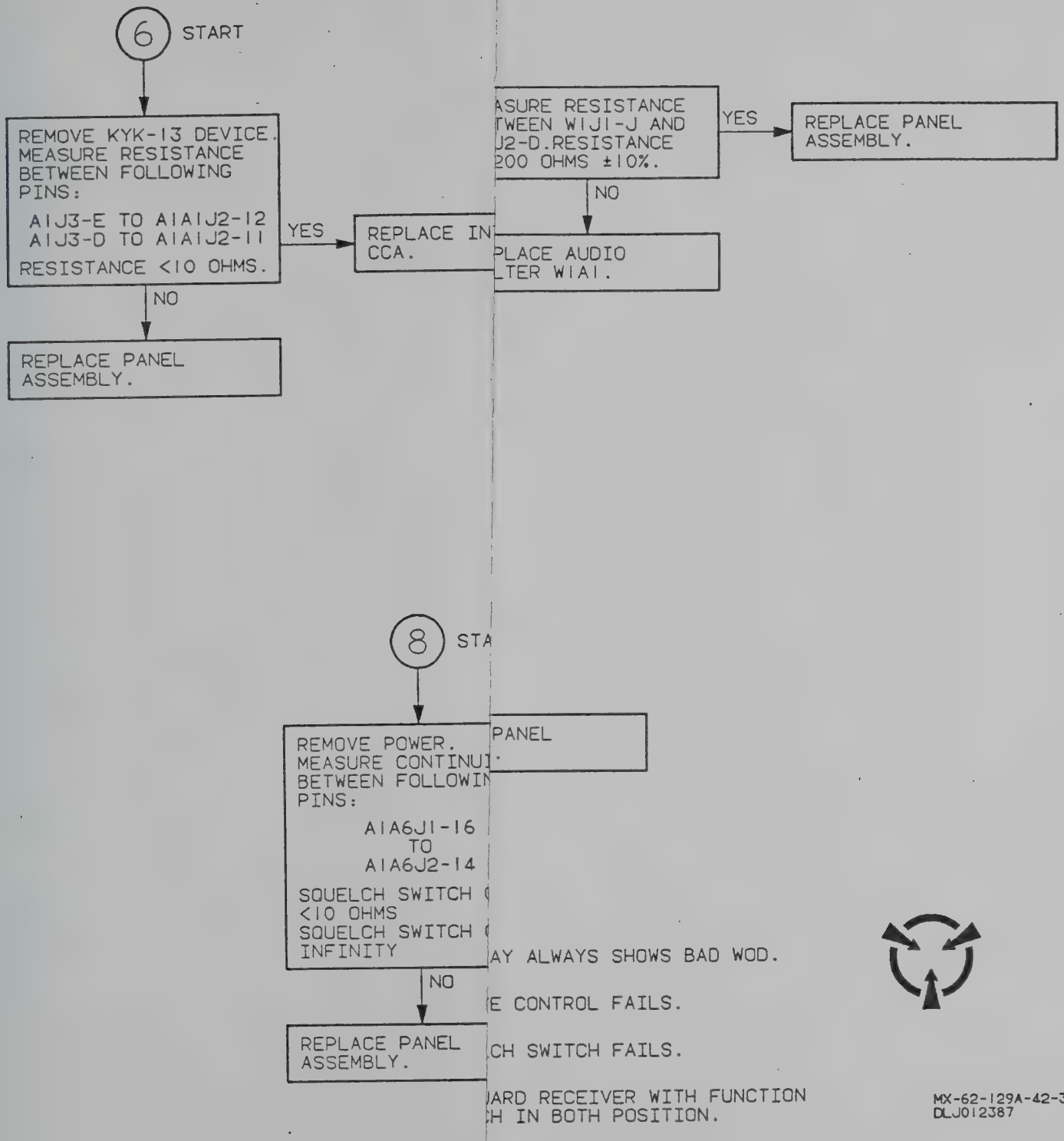
3. CHANNEL SELECT FAILURE.

4. DISPLAY DOES NOT SHOW FILL WITH KYK-13 CONNECTED.

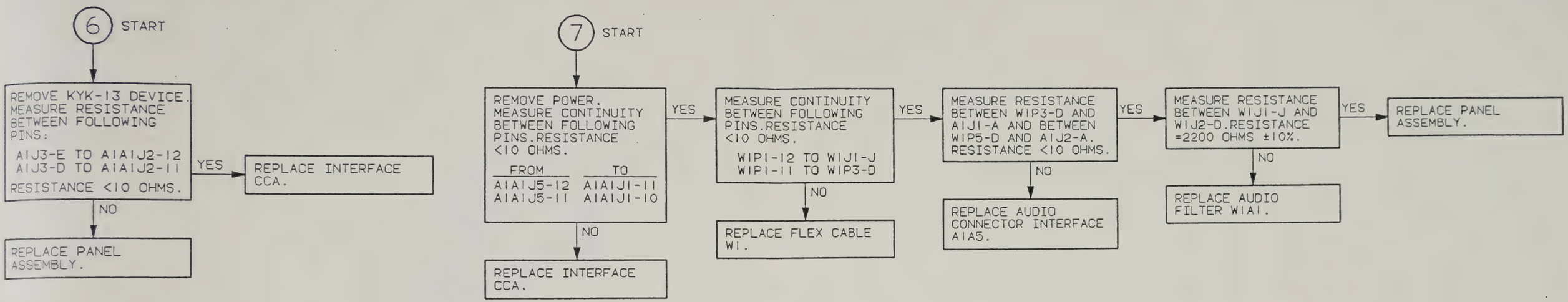
5. DISPLAY DOES NOT CHANGE FROM SHOWING FILL.

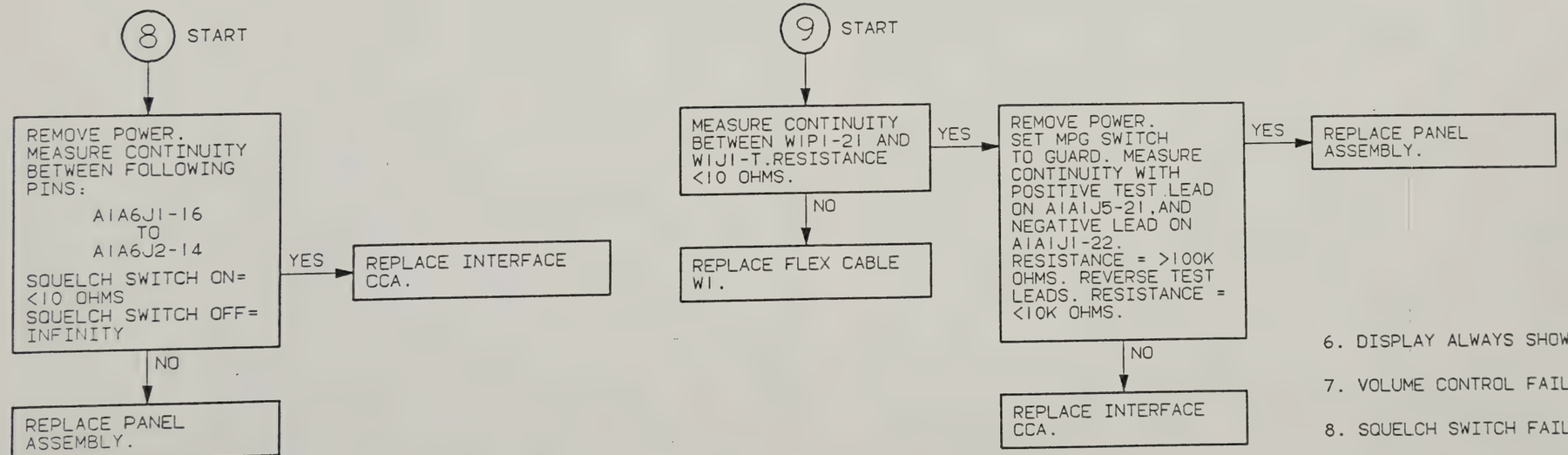
MX-62-129A-42-2A
BLP051288

FO-9. Control C-11816 Trouble Analysis (Sheet 2 of 7)



F0-9. Control C-11816 Trouble Analysis (Sheet 3 of 7)





6. DISPLAY ALWAYS SHOWS BAD WOD.

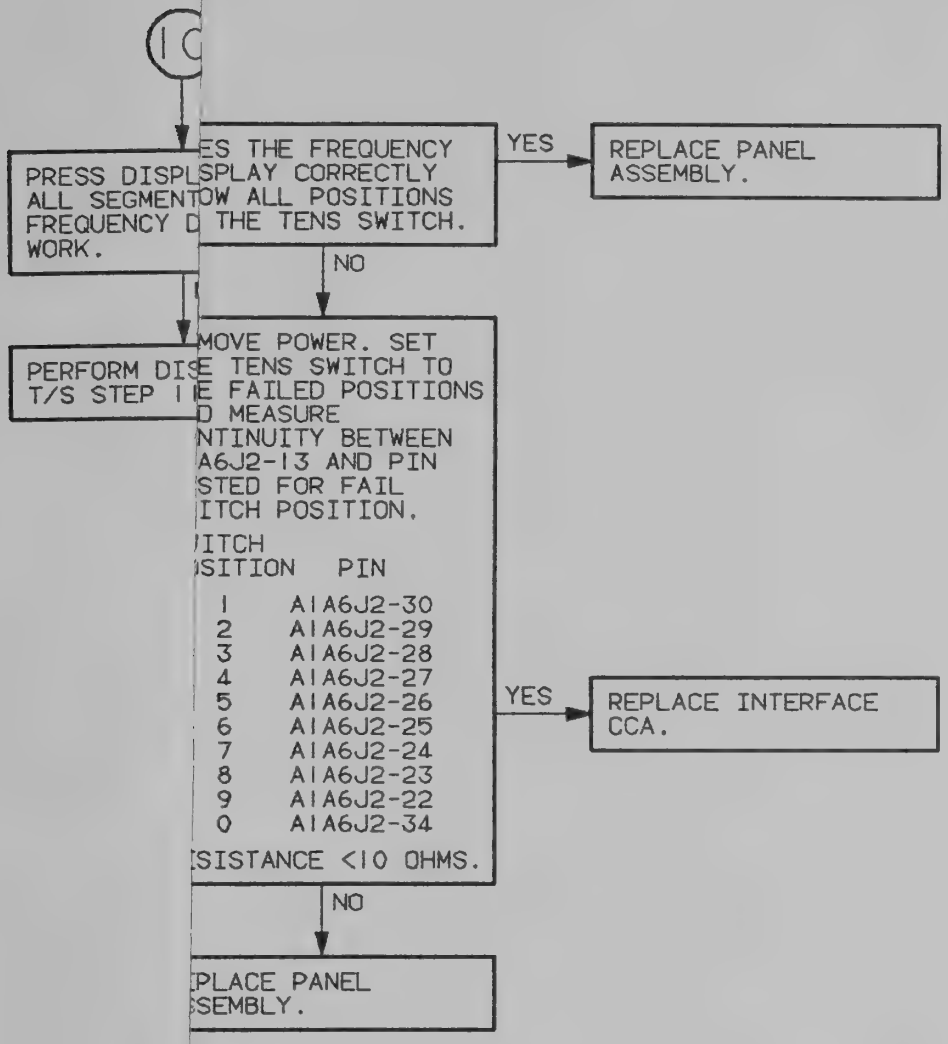
7. VOLUME CONTROL FAILS.

8. SQUELCH SWITCH FAILS.

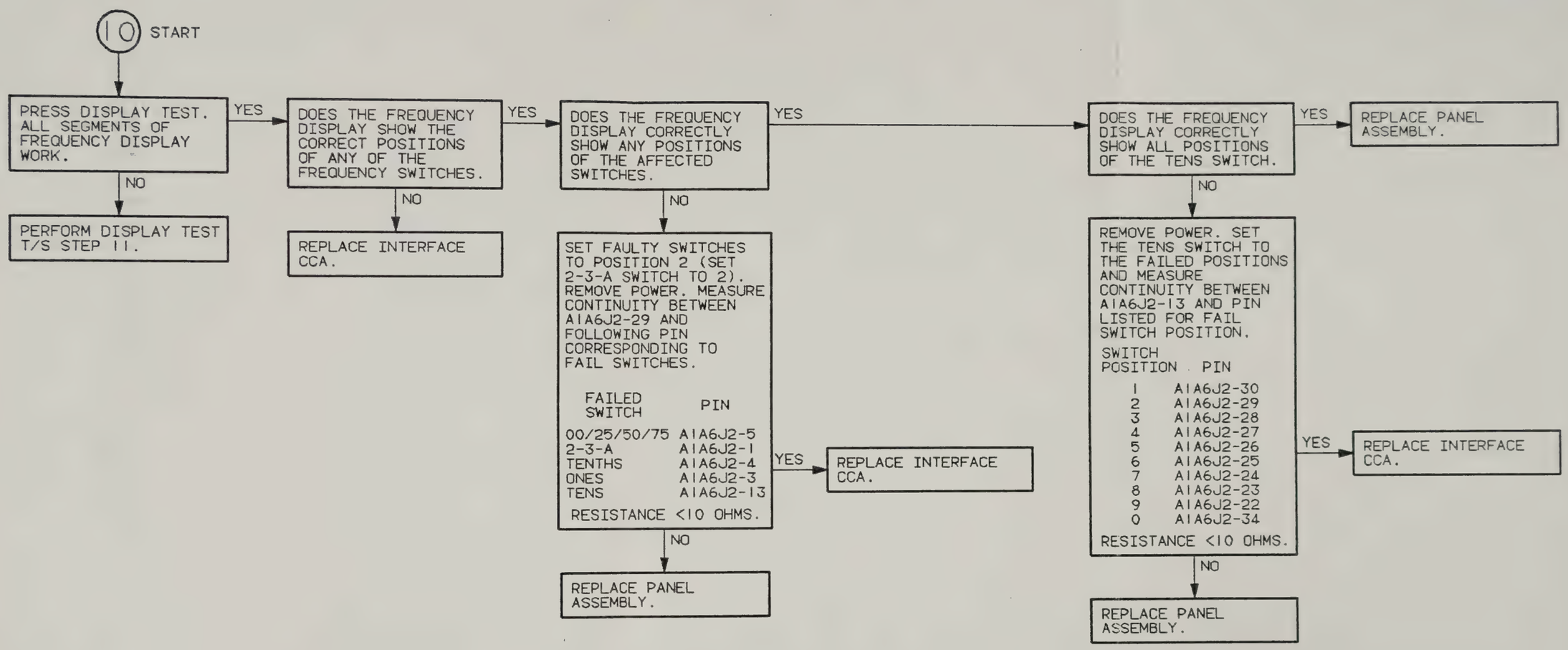
9. NO GUARD RECEIVER WITH FUNCTION SWITCH IN BOTH POSITION.

MX-62-129A-42-3
DLJ012387

FO-9. Control C-11816 Trouble Analysis (Sheet 3 of 7)



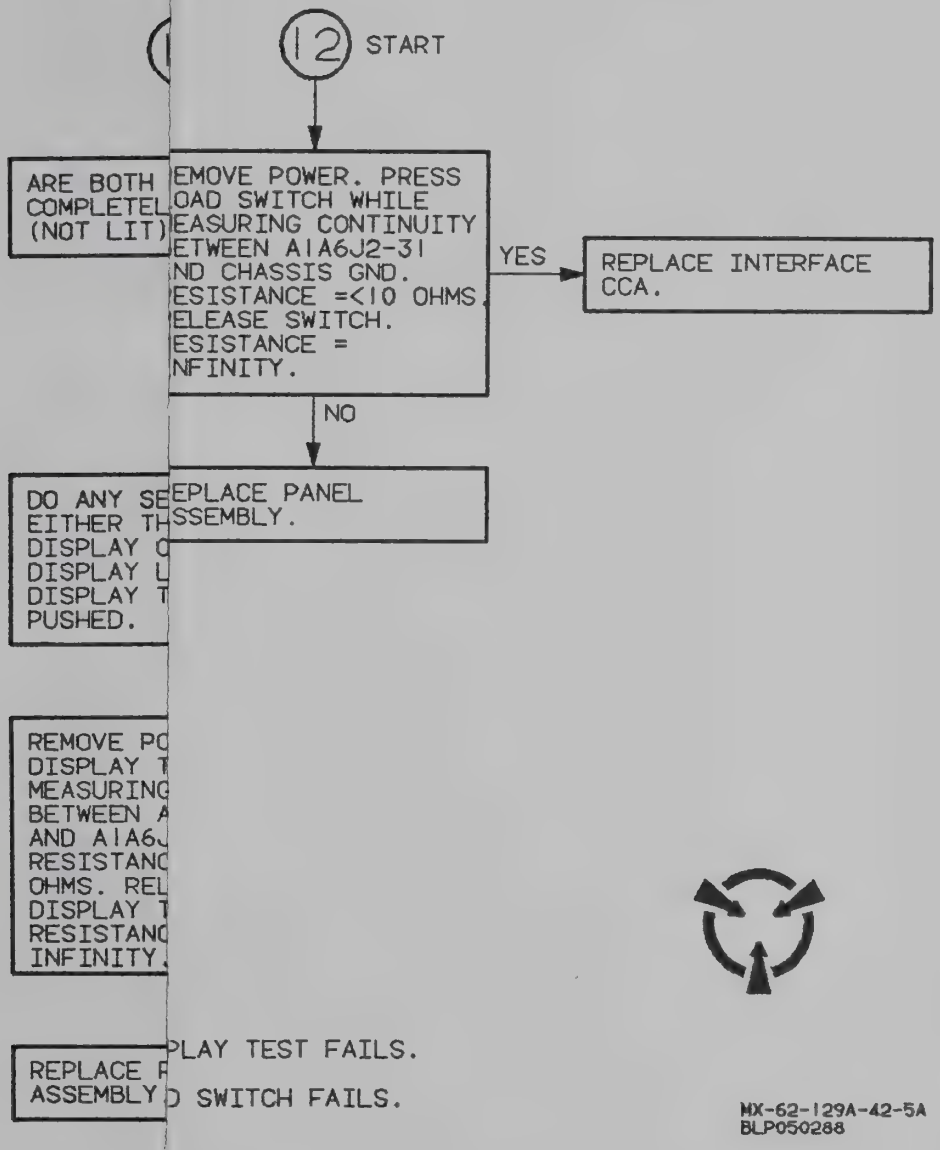
F0-9. Control C-11816 Trouble Analysis (Sheet 4 of 7)



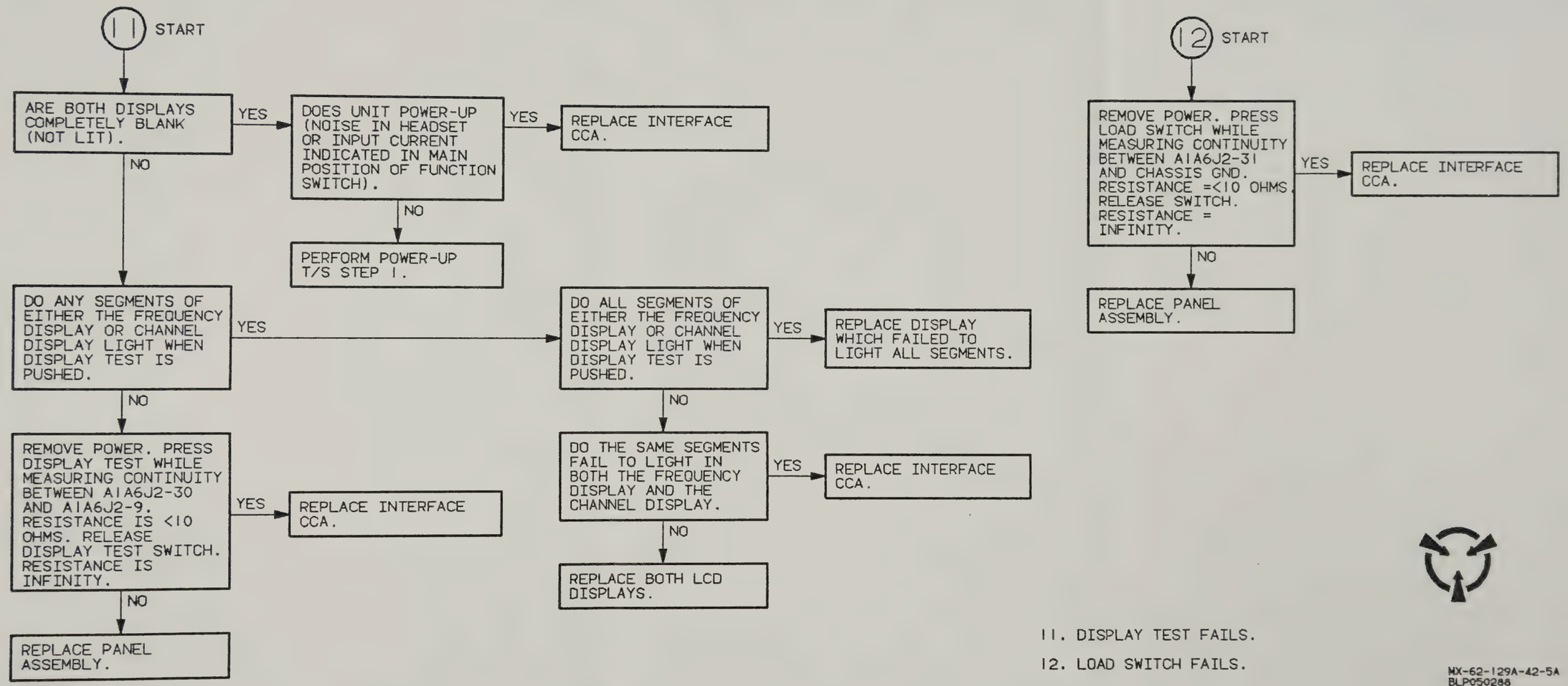
10. FREQUENCY SELECT FAILURE.

MX-62-129A-42-4A
BLP051288

FO-9. Control C-11816 Trouble Analysis (Sheet 4 of 7)



F0-9. Control C-11816 Trouble Analysis (Sheet 5 of 7)

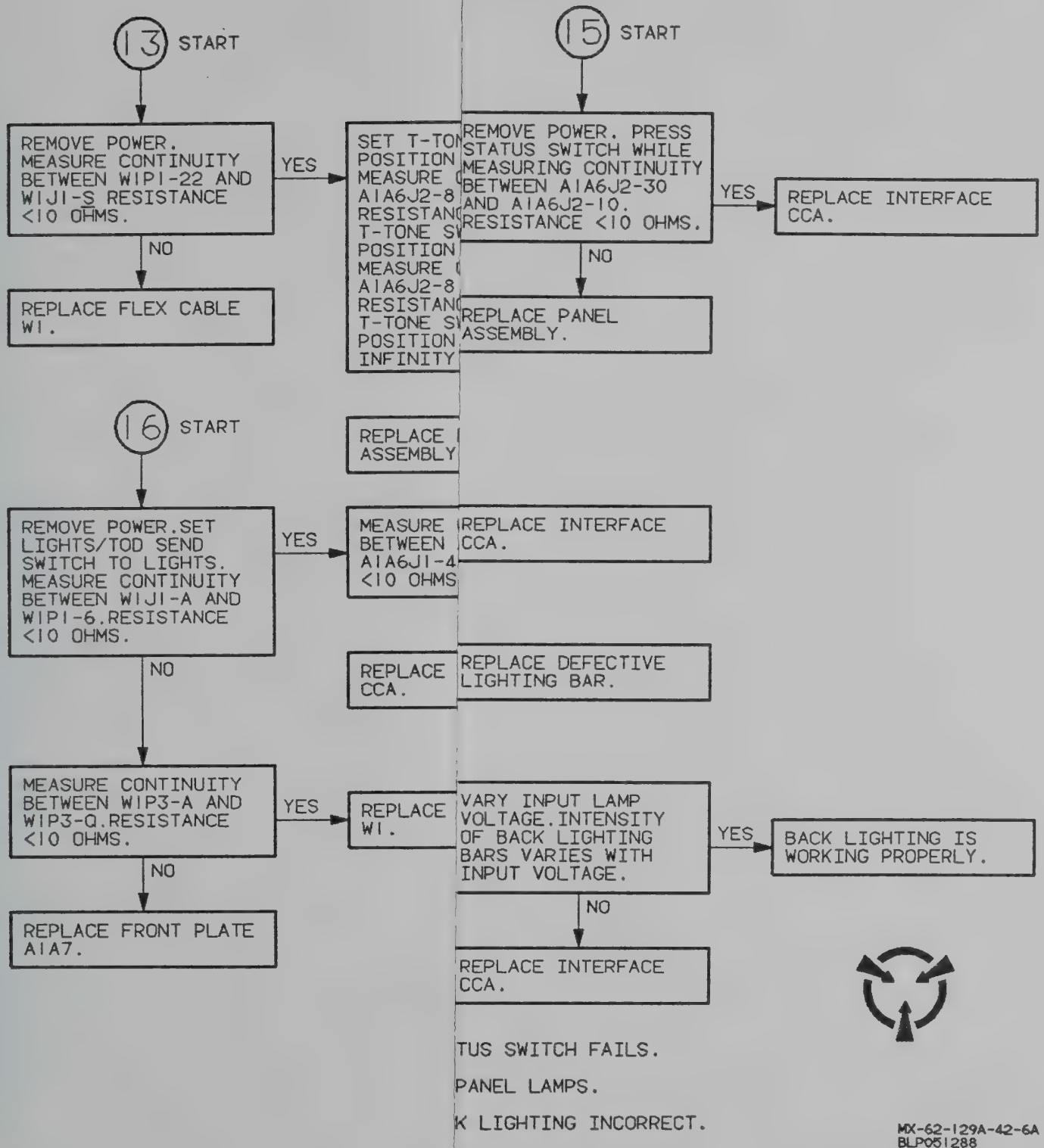

11
START
ARE BOTH DISPLAYS COMPLETELY BLANK (NOT LIT).
YES
DOES UNIT POWER-UP (NOISE IN HEADSET OR INPUT CURRENT INDICATED IN MAIN POSITION OF FUNCTION SWITCH).
YES
REPLACE INTERFACE CCA.
NO
PERFORM POWER-UP T/S STEP 1.
NO
DO ANY SEGMENTS OF EITHER THE FREQUENCY DISPLAY OR CHANNEL DISPLAY LIGHT WHEN DISPLAY TEST IS PUSHED.
YES
DO ALL SEGMENTS OF EITHER THE FREQUENCY DISPLAY OR CHANNEL DISPLAY LIGHT WHEN DISPLAY TEST IS PUSHED.
YES
REPLACE DISPLAY WHICH FAILED TO LIGHT ALL SEGMENTS.
NO
NO
REMOVE POWER. PRESS DISPLAY TEST WHILE MEASURING CONTINUITY BETWEEN A1A6J2-30 AND A1A6J2-9. RESISTANCE IS <10 OHMS. RELEASE DISPLAY TEST SWITCH. RESISTANCE IS INFINITY.
YES
REPLACE INTERFACE CCA.
DO THE SAME SEGMENTS FAIL TO LIGHT IN BOTH THE FREQUENCY DISPLAY AND THE CHANNEL DISPLAY.
YES
REPLACE INTERFACE CCA.
NO
NO
REPLACE PANEL ASSEMBLY.
REPLACE BOTH LCD DISPLAYS.
12
START
REMOVE POWER. PRESS LOAD SWITCH WHILE MEASURING CONTINUITY BETWEEN A1A6J2-31 AND CHASSIS GND. RESISTANCE =<10 OHMS. RELEASE SWITCH. RESISTANCE = INFINITY.
YES
REPLACE INTERFACE CCA.
NO
REPLACE PANEL ASSEMBLY.

11. DISPLAY TEST FAILS.

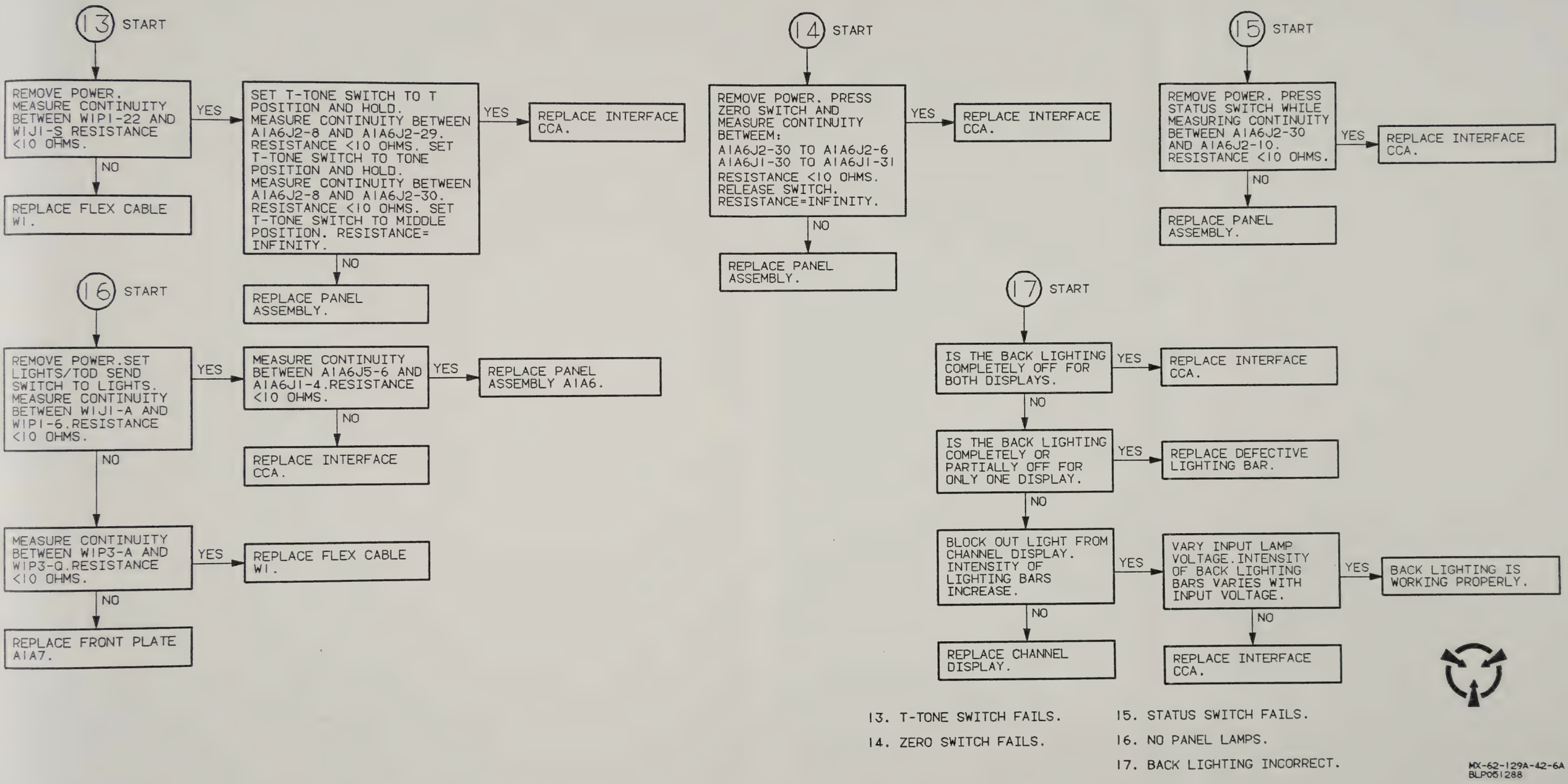
12. LOAD SWITCH FAILS.

MX-62-129A-42-5A
BLP050288

FO-9. Control C-11816 Trouble Analysis (Sheet 5 of 7)


13 START
REMOVE POWER. MEASURE CONTINUITY BETWEEN W1P1-22 AND W1J1-S RESISTANCE <10 OHMS.
YES
NO
REPLACE FLEX CABLE W1.
SET T-TONE POSITION MEASURE A1A6J2-8 RESISTANCE T-TONE SW POSITION MEASURE A1A6J2-8 RESISTANCE T-TONE SW POSITION INFINITY
15 START
REMOVE POWER. PRESS STATUS SWITCH WHILE MEASURING CONTINUITY BETWEEN A1A6J2-30 AND A1A6J2-10. RESISTANCE <10 OHMS.
YES
REPLACE INTERFACE CCA.
NO
REPLACE PANEL ASSEMBLY.
16 START
REPLACE ASSEMBLY
REMOVE POWER.SET LIGHTS/TOD SEND SWITCH TO LIGHTS. MEASURE CONTINUITY BETWEEN W1J1-A AND W1P1-6.RESISTANCE <10 OHMS.
YES
MEASURE BETWEEN A1A6J1-4 <10 OHMS
REPLACE INTERFACE CCA.
NO
REPLACE CCA.
REPLACE DEFECTIVE LIGHTING BAR.
MEASURE CONTINUITY BETWEEN W1P3-A AND W1P3-Q.RESISTANCE <10 OHMS.
YES
REPLACE W1.
VARY INPUT LAMP VOLTAGE.INTENSITY OF BACK LIGHTING BARS VARIES WITH INPUT VOLTAGE.
YES
BACK LIGHTING IS WORKING PROPERLY.
NO
REPLACE FRONT PLATE A1A7.
REPLACE INTERFACE CCA.
TUS SWITCH FAILS.
PANEL LAMPS.
K LIGHTING INCORRECT.
MX-62-129A-42-6A
BLP051288

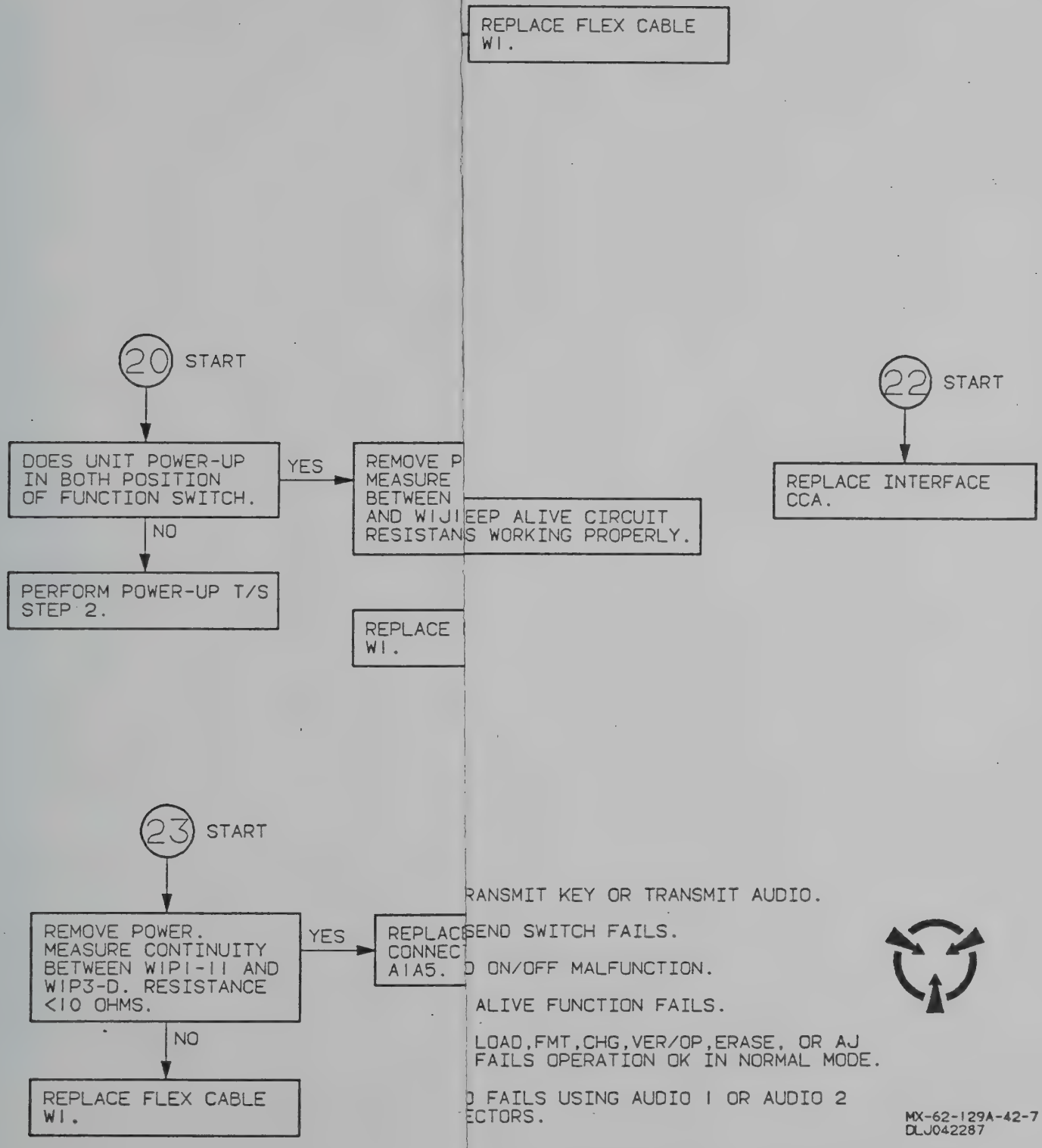
FO-9. Control C-11816 Trouble Analysis (Sheet 6 of 7)


13 START
REMOVE POWER. MEASURE CONTINUITY BETWEEN W1P1-22 AND W1J1-S RESISTANCE <10 OHMS.
YES
NO
REPLACE FLEX CABLE W1.
SET T-TONE SWITCH TO T POSITION AND HOLD. MEASURE CONTINUITY BETWEEN A1A6J2-8 AND A1A6J2-29. RESISTANCE <10 OHMS. SET T-TONE SWITCH TO TONE POSITION AND HOLD. MEASURE CONTINUITY BETWEEN A1A6J2-8 AND A1A6J2-30. RESISTANCE <10 OHMS. SET T-TONE SWITCH TO MIDDLE POSITION. RESISTANCE= INFINITY.
YES
NO
REPLACE INTERFACE CCA.
REPLACE PANEL ASSEMBLY.
14 START
REMOVE POWER. PRESS ZERO SWITCH AND MEASURE CONTINUITY BETWEEM:
A1A6J2-30 TO A1A6J2-6
A1A6J1-30 TO A1A6J1-31
RESISTANCE <10 OHMS.
RELEASE SWITCH.
RESISTANCE=INFINITY.
YES
NO
REPLACE INTERFACE CCA.
REPLACE PANEL ASSEMBLY.
15 START
REMOVE POWER. PRESS STATUS SWITCH WHILE MEASURING CONTINUITY BETWEEN A1A6J2-30 AND A1A6J2-10. RESISTANCE <10 OHMS.
YES
NO
REPLACE INTERFACE CCA.
REPLACE PANEL ASSEMBLY.
16 START
REMOVE POWER.SET LIGHTS/TOD SEND SWITCH TO LIGHTS. MEASURE CONTINUITY BETWEEN W1J1-A AND W1P1-6.RESISTANCE <10 OHMS.
YES
NO
MEASURE CONTINUITY BETWEEN A1A6J5-6 AND A1A6J1-4.RESISTANCE <10 OHMS.
YES
NO
REPLACE PANEL ASSEMBLY A1A6.
REPLACE INTERFACE CCA.
MEASURE CONTINUITY BETWEEN W1P3-A AND W1P3-Q.RESISTANCE <10 OHMS.
YES
NO
REPLACE FLEX CABLE W1.
REPLACE FRONT PLATE A1A7.
17 START
IS THE BACK LIGHTING COMPLETELY OFF FOR BOTH DISPLAYS.
YES
NO
REPLACE INTERFACE CCA.
IS THE BACK LIGHTING COMPLETELY OR PARTIALLY OFF FOR ONLY ONE DISPLAY.
YES
NO
REPLACE DEFECTIVE LIGHTING BAR.
BLOCK OUT LIGHT FROM CHANNEL DISPLAY. INTENSITY OF LIGHTING BARS INCREASE.
YES
NO
REPLACE CHANNEL DISPLAY.
VARY INPUT LAMP VOLTAGE.INTENSITY OF BACK LIGHTING BARS VARIES WITH INPUT VOLTAGE.
YES
NO
REPLACE INTERFACE CCA.
BACK LIGHTING IS WORKING PROPERLY.

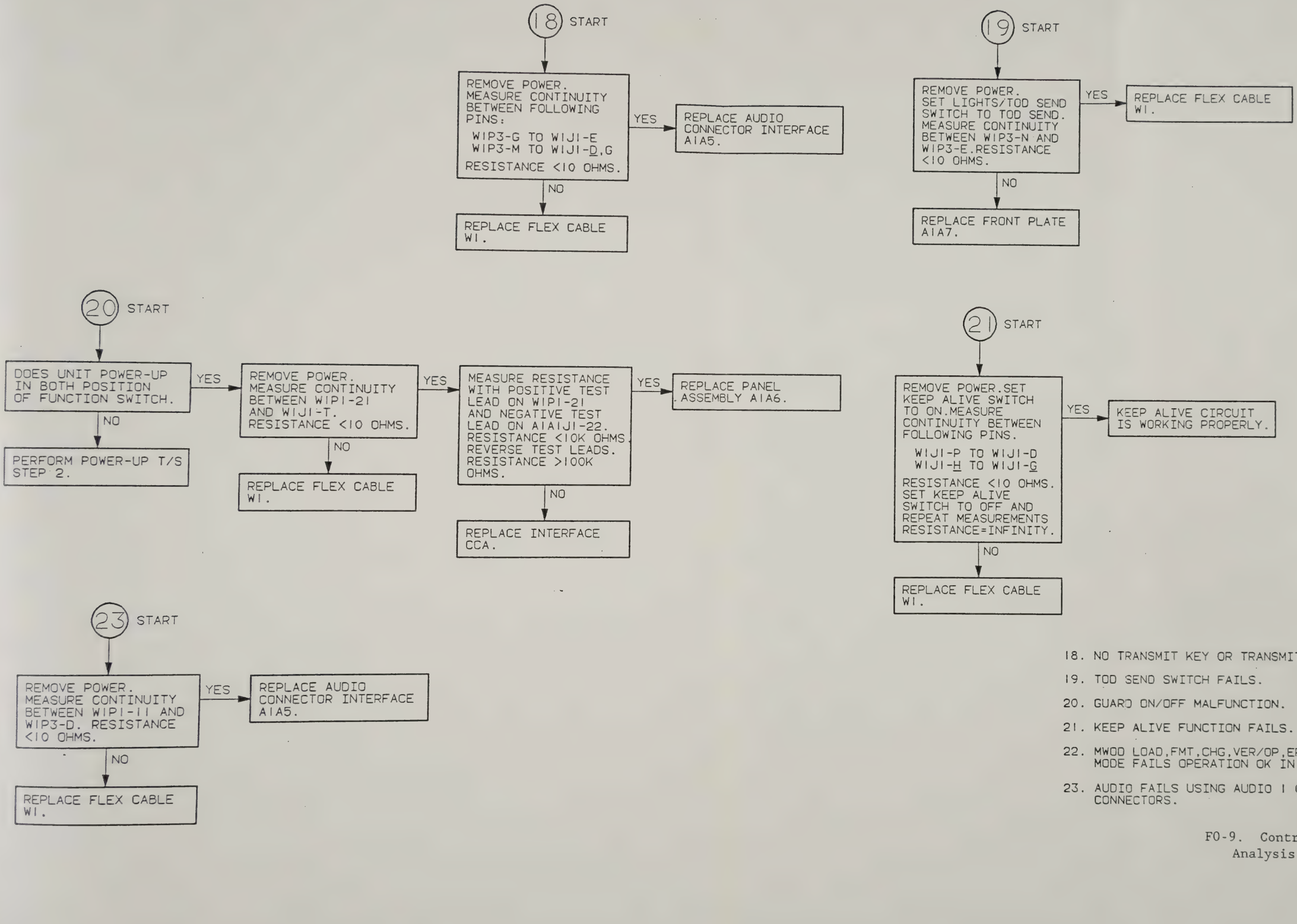
13. T-TONE SWITCH FAILS.
14. ZERO SWITCH FAILS.
15. STATUS SWITCH FAILS.
16. NO PANEL LAMPS.
17. BACK LIGHTING INCORRECT.

MX-62-129A-42-6A
BLP051288

FO-9. Control C-11816 Trouble Analysis (Sheet 6 of 7)



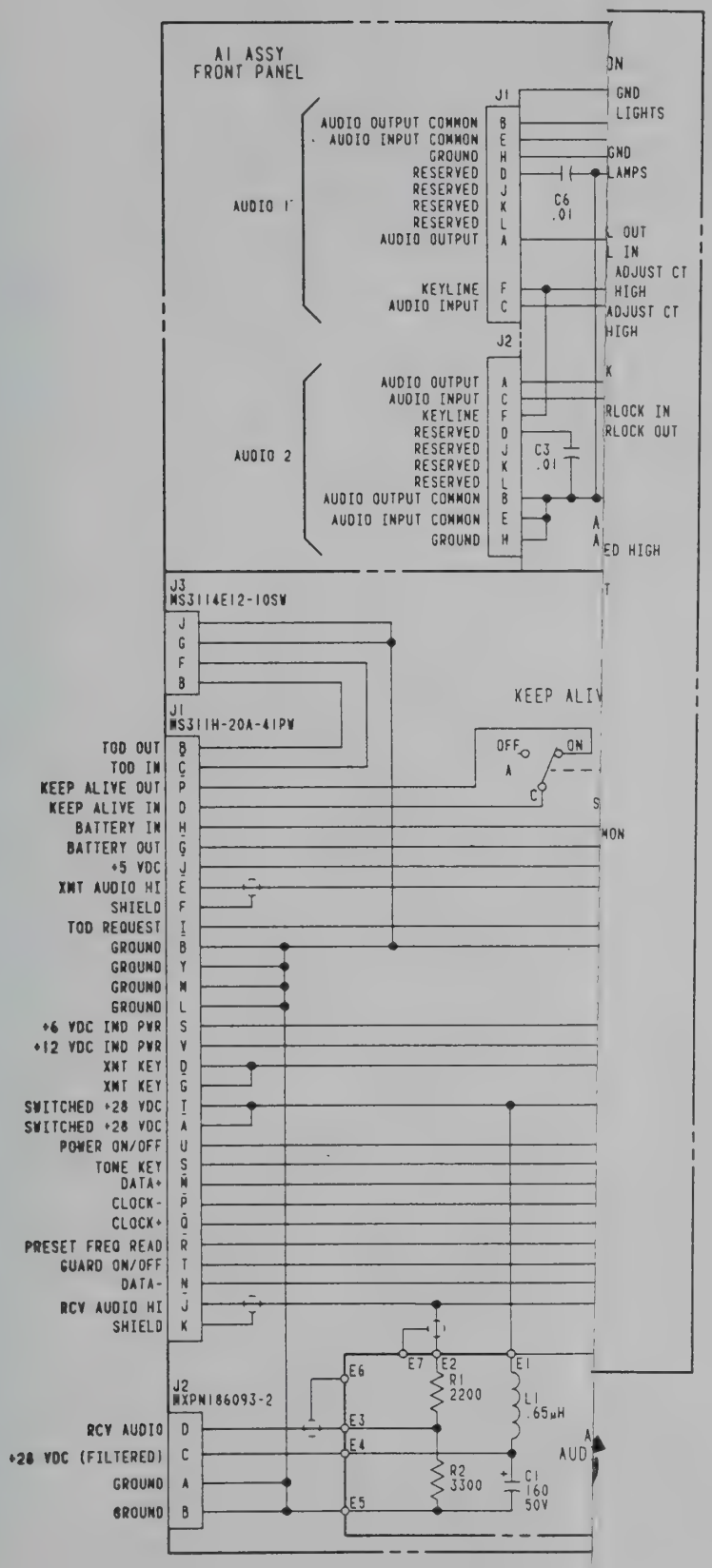
F0-9. Control C-11816 Trouble Analysis (Sheet 7 of 7)


18 START
REMOVE POWER. MEASURE CONTINUITY BETWEEN FOLLOWING PINS:
WIP3-G TO WIJI-E
WIP3-M TO WIJI-D,G
RESISTANCE <10 OHMS.
YES
REPLACE AUDIO CONNECTOR INTERFACE A1A5.
NO
REPLACE FLEX CABLE W1.
19 START
REMOVE POWER. SET LIGHTS/TOD SEND SWITCH TO TOD SEND. MEASURE CONTINUITY BETWEEN WIP3-N AND WIP3-E. RESISTANCE <10 OHMS.
YES
REPLACE FLEX CABLE W1.
NO
REPLACE FRONT PLATE A1A7.
20 START
DOES UNIT POWER-UP IN BOTH POSITION OF FUNCTION SWITCH.
YES
NO
PERFORM POWER-UP T/S STEP 2.
REMOVE POWER. MEASURE CONTINUITY BETWEEN WIP1-21 AND WIJI-T. RESISTANCE <10 OHMS.
YES
NO
REPLACE FLEX CABLE W1.
MEASURE RESISTANCE WITH POSITIVE TEST LEAD ON WIP1-21 AND NEGATIVE TEST LEAD ON A1A1J1-22. RESISTANCE <10K OHMS. REVERSE TEST LEADS. RESISTANCE >100K OHMS.
YES
REPLACE PANEL ASSEMBLY A1A6.
NO
REPLACE INTERFACE CCA.
21 START
REMOVE POWER. SET KEEP ALIVE SWITCH TO ON. MEASURE CONTINUITY BETWEEN FOLLOWING PINS.
WIJI-P TO WIJI-D
WIJI-H TO WIJI-G
RESISTANCE <10 OHMS. SET KEEP ALIVE SWITCH TO OFF AND REPEAT MEASUREMENTS RESISTANCE=INFINITY.
YES
KEEP ALIVE CIRCUIT IS WORKING PROPERLY.
NO
REPLACE FLEX CABLE W1.
22 START
REPLACE INTERFACE CCA.
23 START
REMOVE POWER. MEASURE CONTINUITY BETWEEN WIP1-11 AND WIP3-D. RESISTANCE <10 OHMS.
YES
REPLACE AUDIO CONNECTOR INTERFACE A1A5.
NO
REPLACE FLEX CABLE W1.

18. NO TRANSMIT KEY OR TRANSMIT AUDIO.
19. TOD SEND SWITCH FAILS.
20. GUARD ON/OFF MALFUNCTION.
21. KEEP ALIVE FUNCTION FAILS.
22. MWOD LOAD,FMT,CHG,VER/OP,ERASE, OR AJ MODE FAILS OPERATION OK IN NORMAL MODE.
23. AUDIO FAILS USING AUDIO 1 OR AUDIO 2 CONNECTORS.

MX-62-129A-42-7
DLJ042287

FO-9. Control C-11816 Trouble Analysis (Sheet 7 of 7)

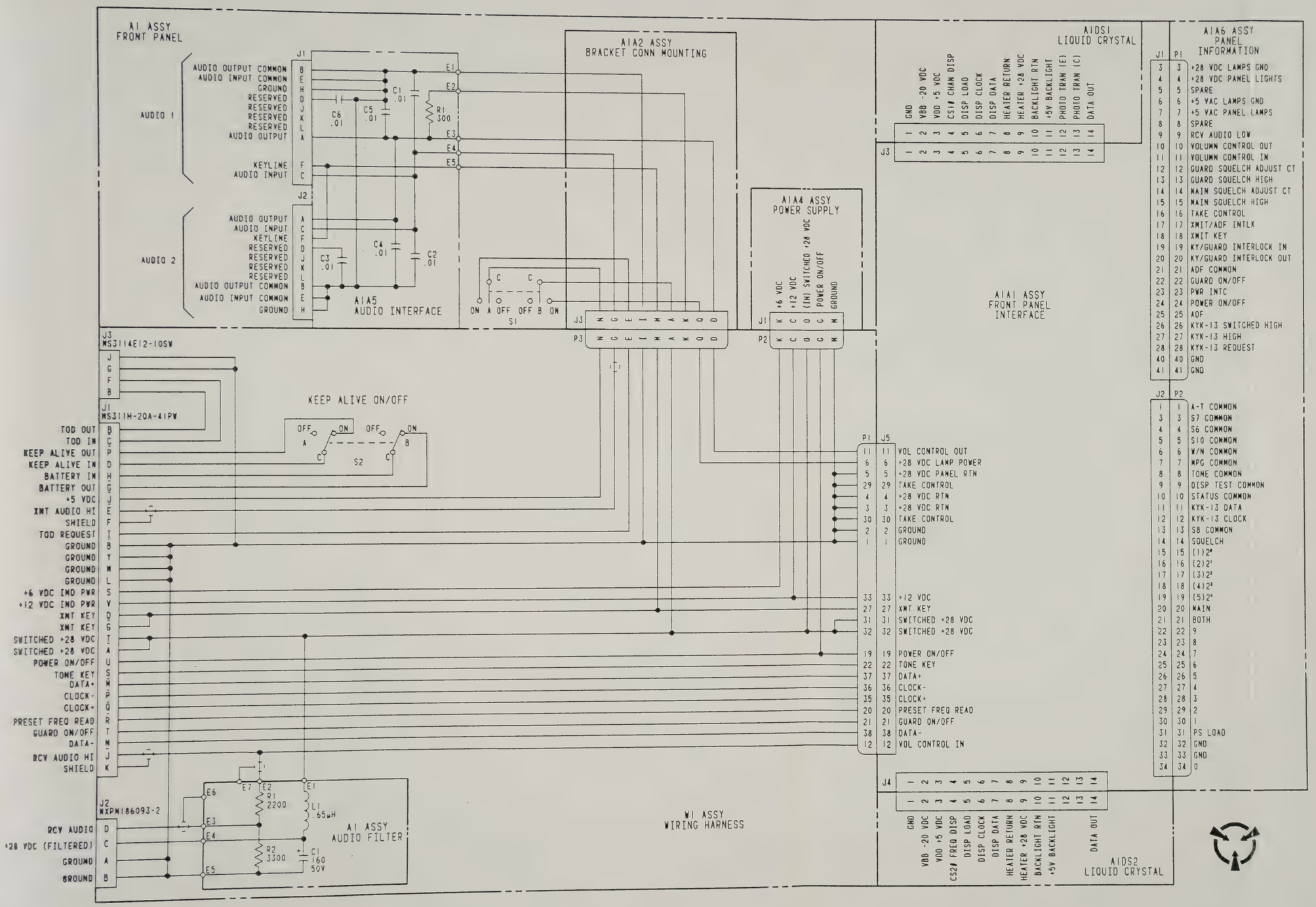


REFERENCE DESIGNATION	ASSEMBLY NUMBER	PRINTED WIRING BOARD	SCHEMATIC NUMBER
A1	818916-801	———	397664
A1A1	816192-801	413563-1	396207
A1A2	943805-801	———	———
A1A4	918837-802	216440-1	499366
A1A5	810736-801	216440-1	411302-1
A1A6	819167-1	———	———
W1	420163-801	———	———
W1A1	810621-801	411327-1	———

REFERENCE DESIGNATION	
HIGHEST USED	NOT USED
A1 W1	
A1 ASSY	
A6	A2,3
A1A1 ASSY	
A1A2 ASSY	
A1A4 ASSY	
A1A5 ASSY	
C6 E5 R1	
A1A6 ASSY	
P2	
W1 ASSY	
A1 J3 P3 S2	
W1A1 ASSY	
C1 E7 L1 R2	

MX-62-129A-43
DLP052368

F0-10. Control C-11816 Wiring Harness Schematic Diagram

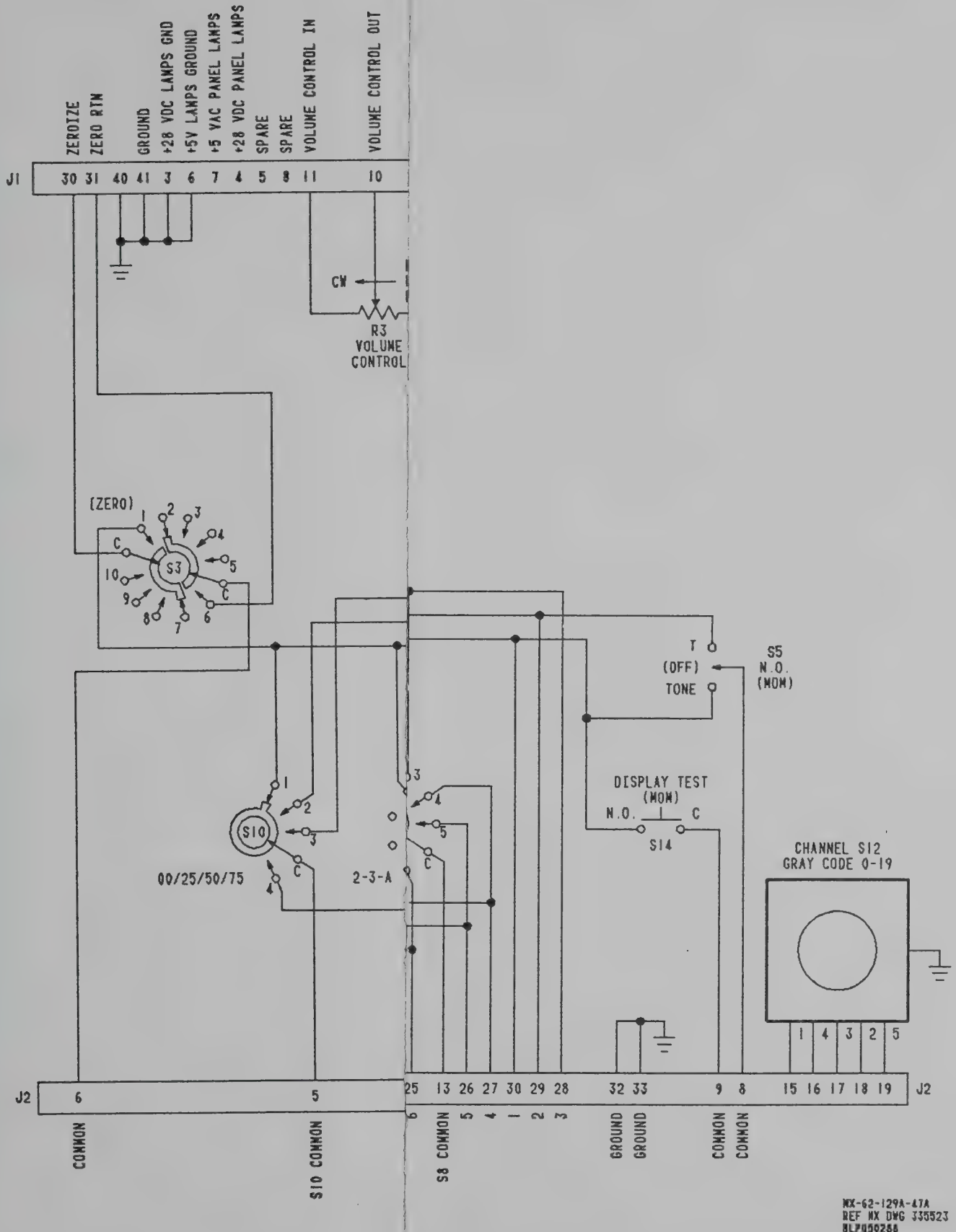


REFERENCE DESIGNATION	ASSEMBLY NUMBER	PRINTED WIRING BOARD	SCHEMATIC NUMBER
A1	818916-801	——	397664
A1A1	816192-801	413563-1	396207
A1A2	943805-801	——	——
A1A4	918837-802	216440-1	499366
A1A5	810736-801	216440-1	411302-1
A1A6	819167-1	——	——
W1	420163-801	——	——
W1A1	810621-801	411327-1	——

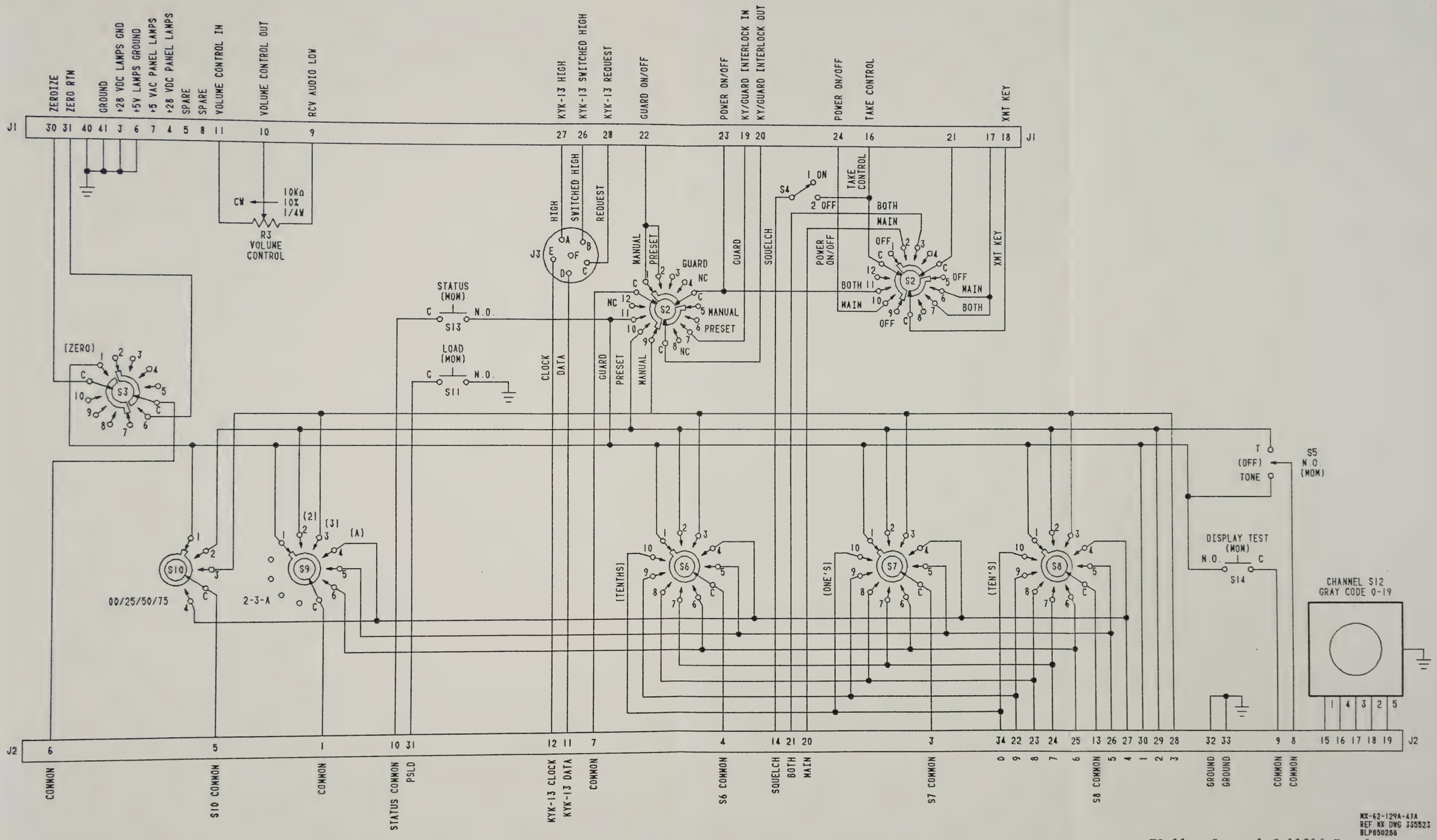
REFERENCE DESIGNATION	
HIGHEST USED	NOT USED
A1 W1	
A1 ASSY	
A6	A2,3
A1A1 ASSY	
A1A2 ASSY	
A1A4 ASSY	
A1A5 ASSY	
C6 E5 R1	
A1A6 ASSY	
P2	
W1 ASSY	
A1 J3 P3 S2	
W1A1 ASSY	
C1 E7 L1 R2	

MX-62-129A-43
DLP052388

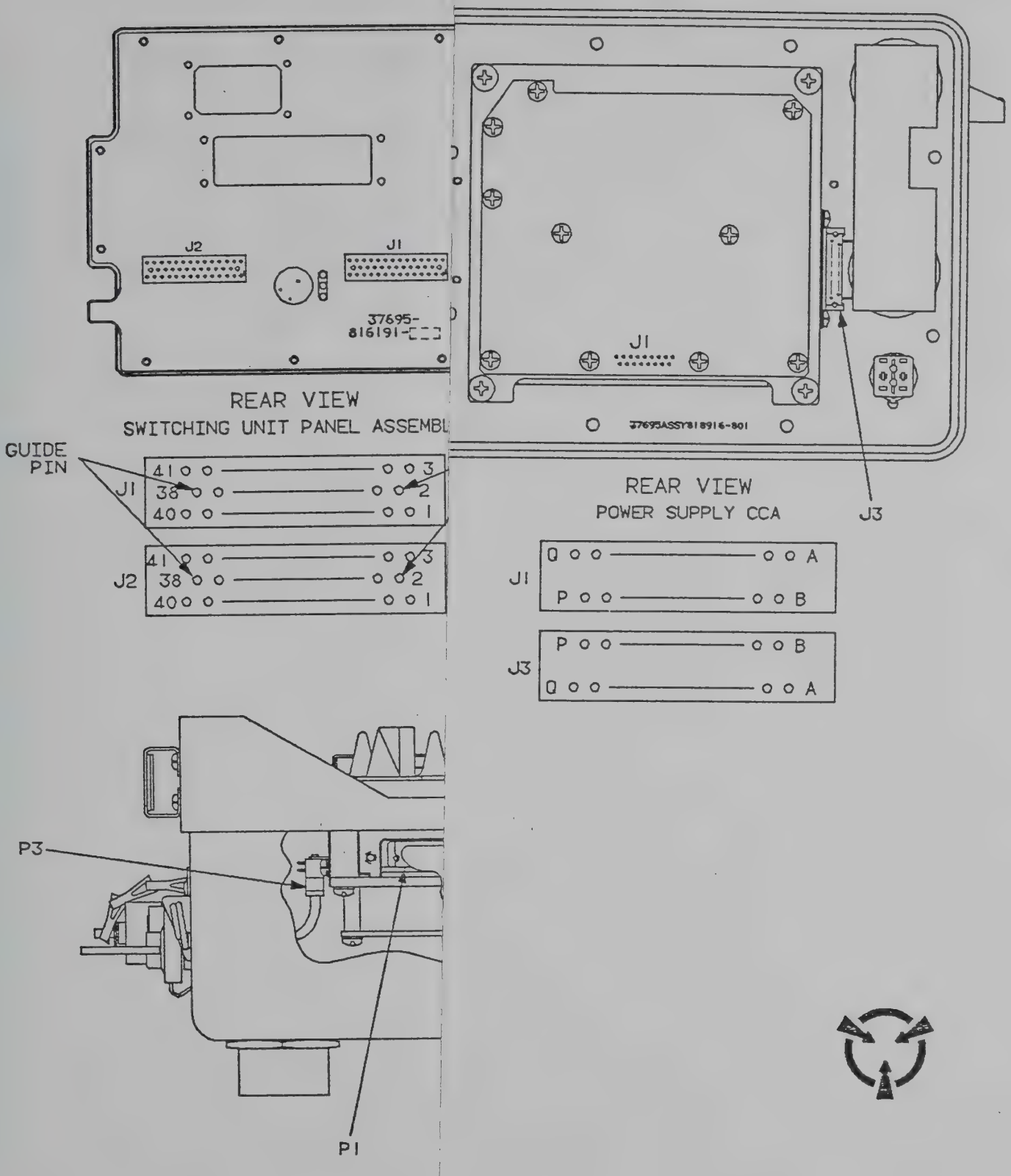
FO-10. Control C-11816 Wiring Harness Schematic Diagram



FO-11. Control C-11816 Panel Assembly Schematic Diagram

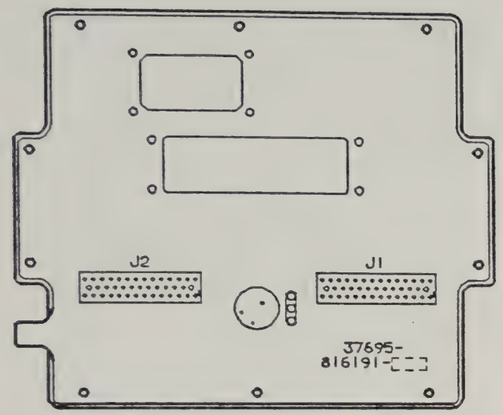


FO-11. Control C-11816 Panel Assembly Schematic Diagram

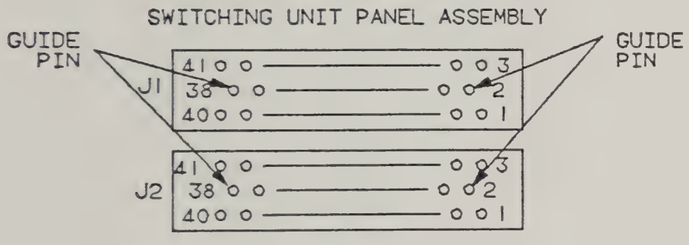


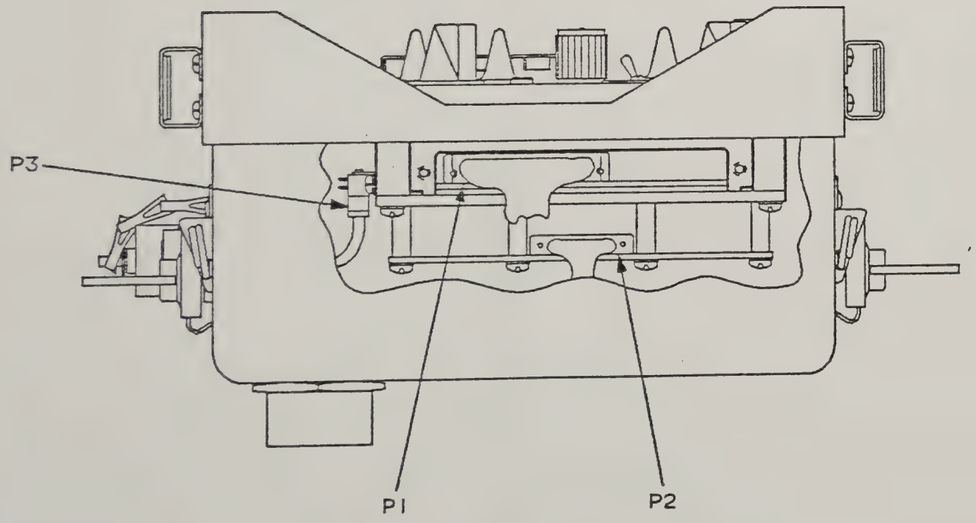
MX-62-129A-51
DLJ042987

FO-12. Control C-11816 Connector Pin Assignments

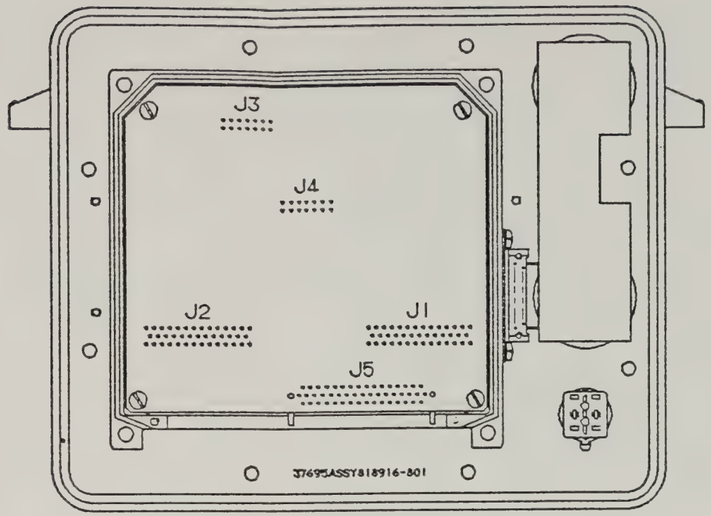


REAR VIEW
SWITCHING UNIT PANEL ASSEMBLY

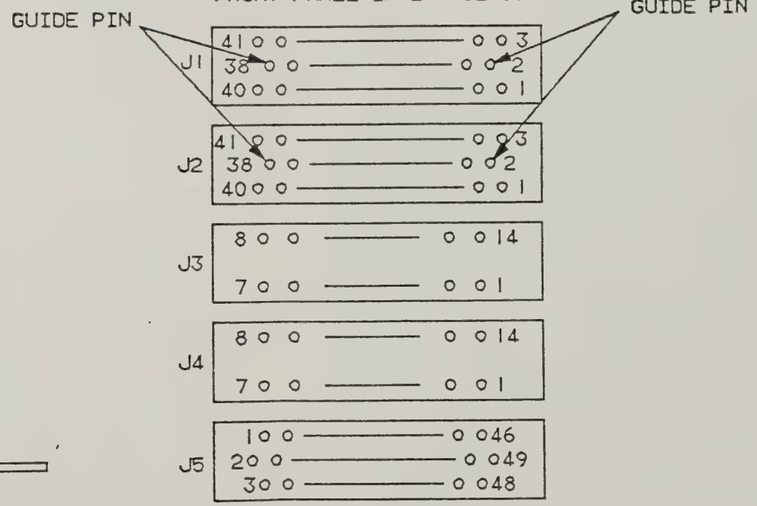


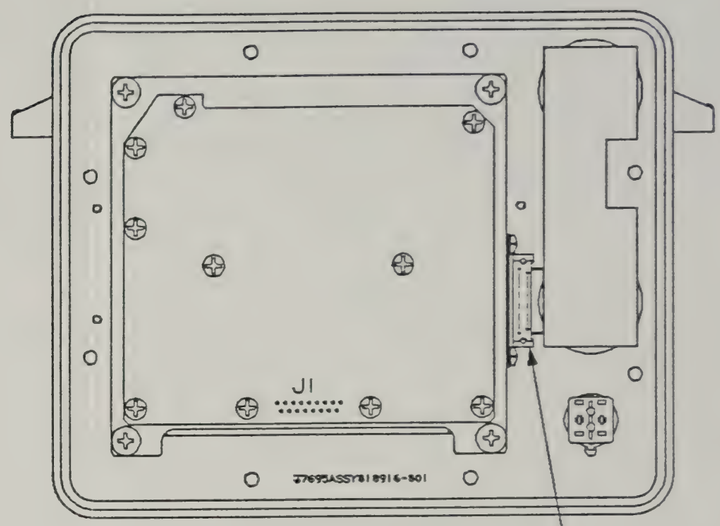


BOTTOM VIEW
CONTROL C-11816

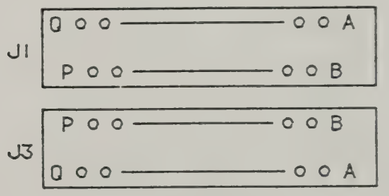


REAR VIEW
FRONT PANEL INTERFACE CCA





REAR VIEW
POWER SUPPLY CCA



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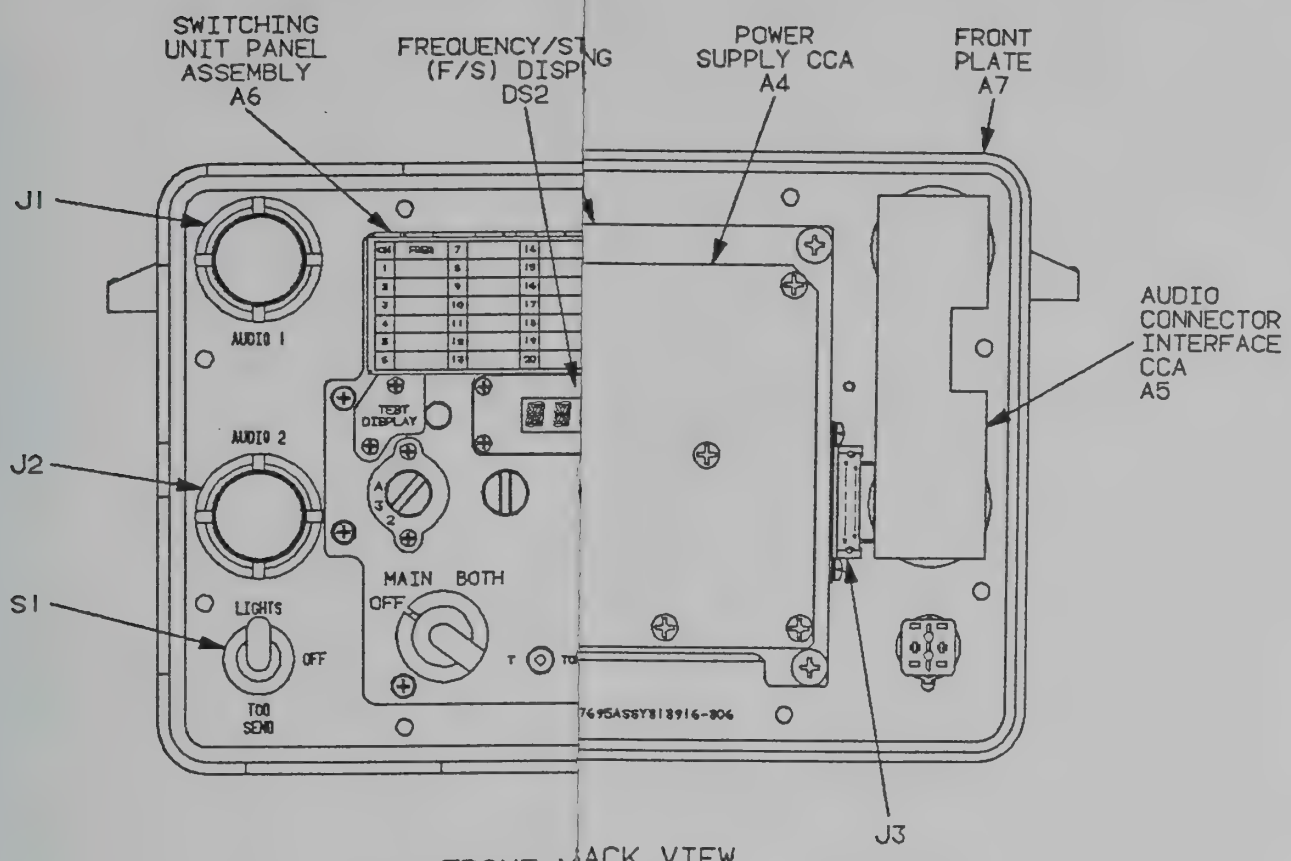
DLJ042987

FO-12. Control C-11816 Connector Pin Assignments

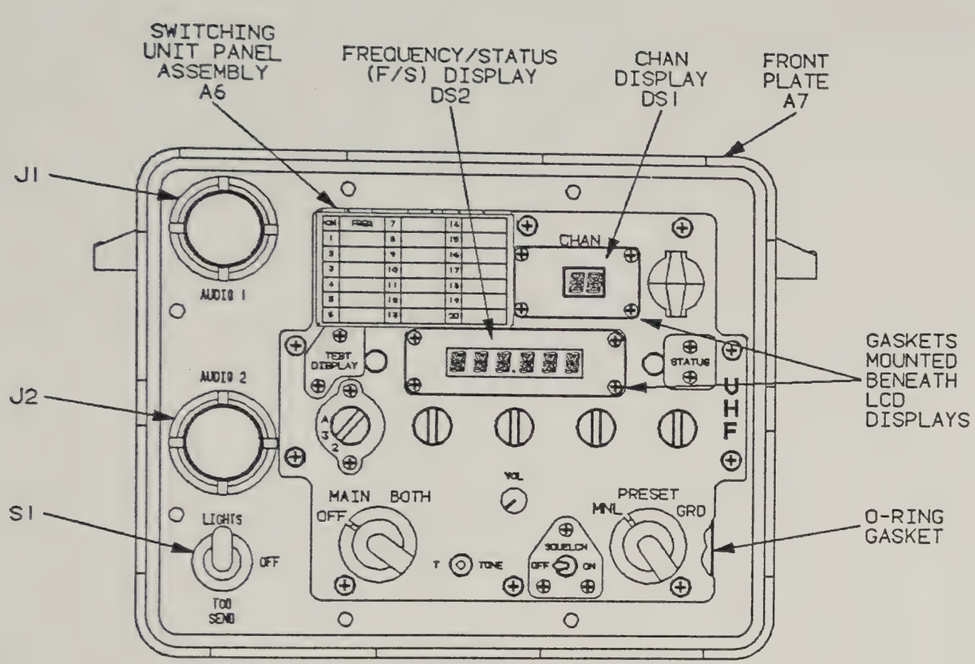


NOTES:

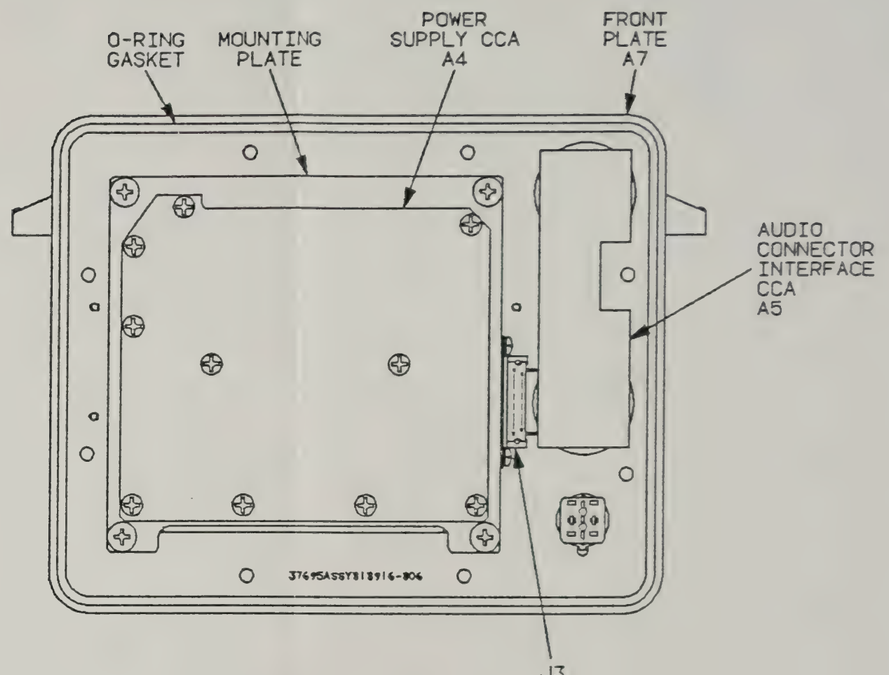
1. REAR HOUSING REMOVED IN ALL VIEWS
2. GASKETS REQUIRE LUBRICATION AS SPECIFIED IN ASSEMBLY/DISASSEMBLY PROCEDURES

MX-62-129A-50A
BLP052488

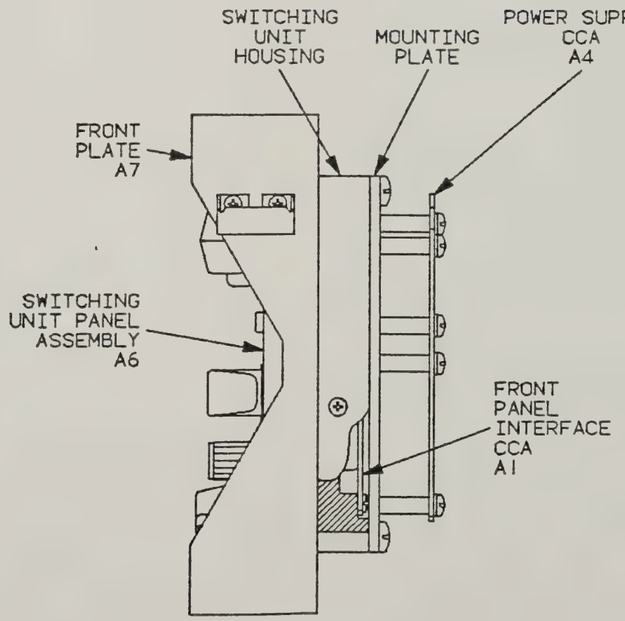
FO-13. Control C-11816
Configuration Drawing



FRONT VIEW



BACK VIEW



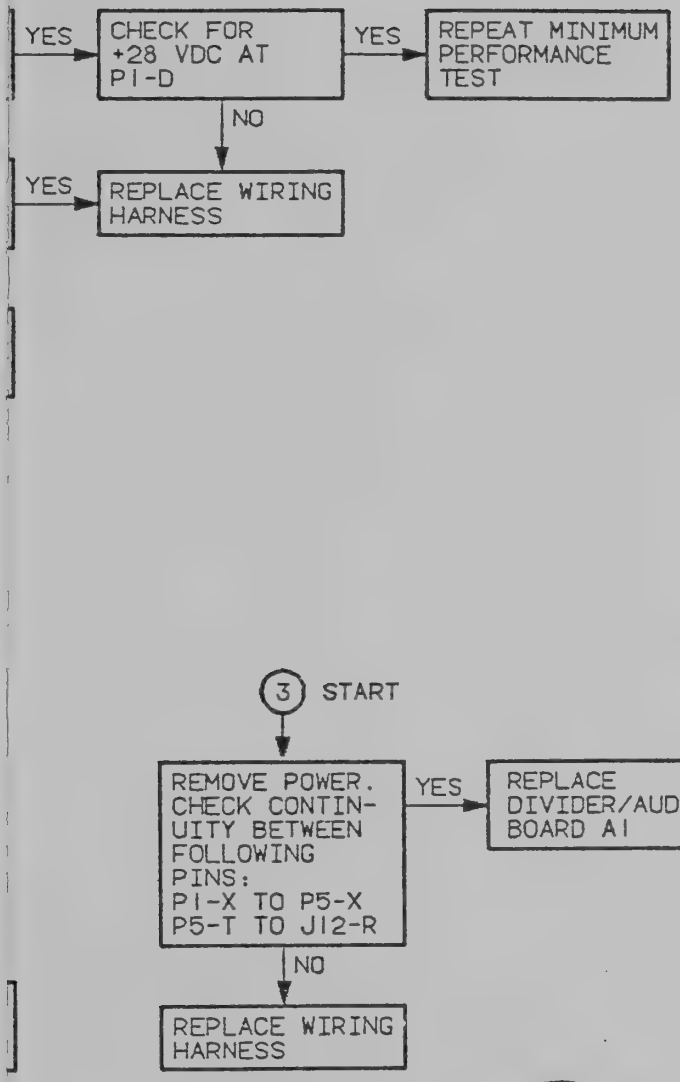
SIDE VIEW

NOTE:

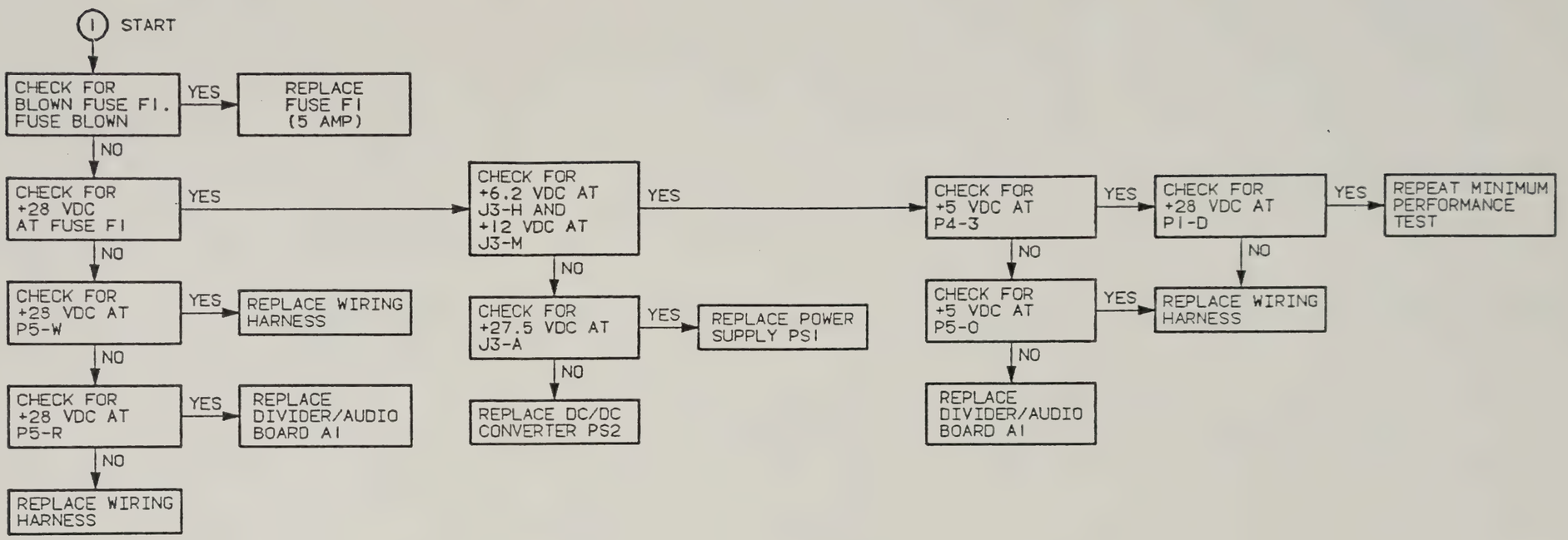
1. REAR HOUSING REMOVED IN ALL VIEWS
2. GASKETS REQUIRE LUBRICATION AS SPECIFIED IN ASSEMBLY/DISASSEMBLY PROCEDURES

MX-62-129A-50A
BLP052488

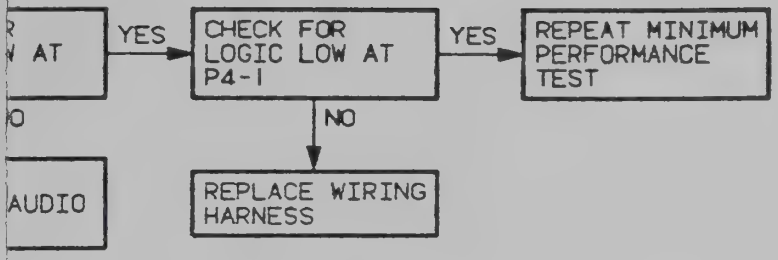
FO-13. Control C-11816
Configuration Drawing



FO-14. Mounting Base MT-6165
Trouble Analysis (Sheet 1 of 2)



FO-14. Mounting Base MT-6165
Trouble Analysis (Sheet 1 of 2)



OR NOT PROVIDING SYNC IN RT.
T OR RECEIVE FUNCTIONS FAIL.
S GOOD.

MX-62-129A-49-2
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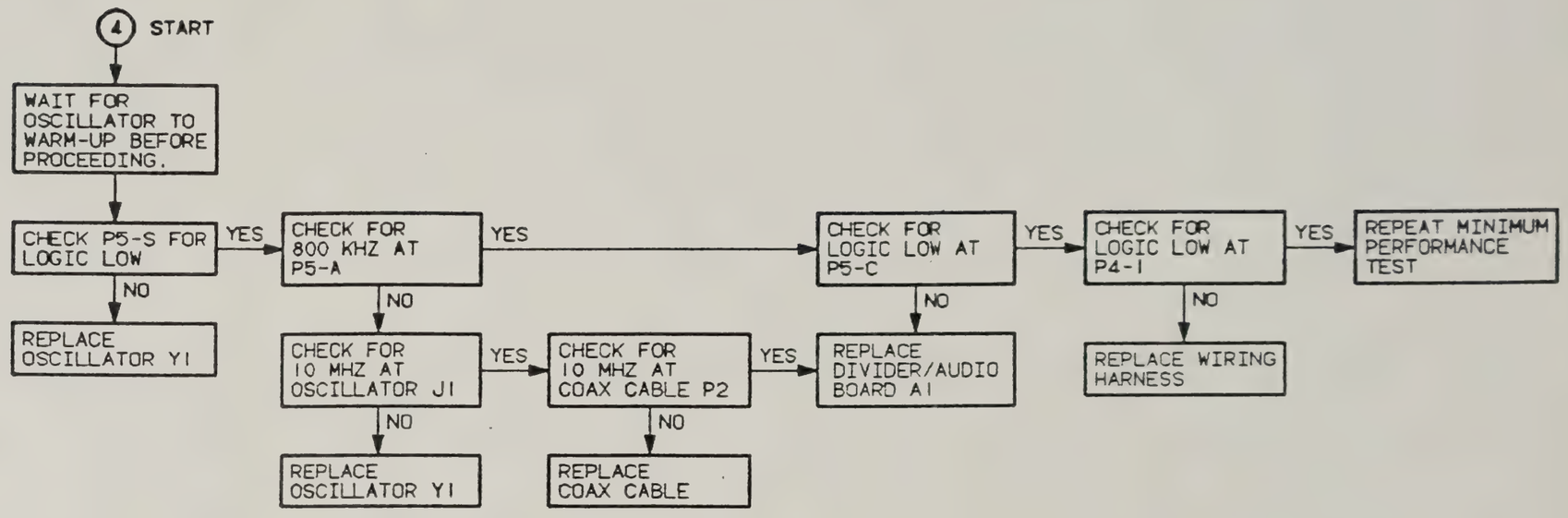
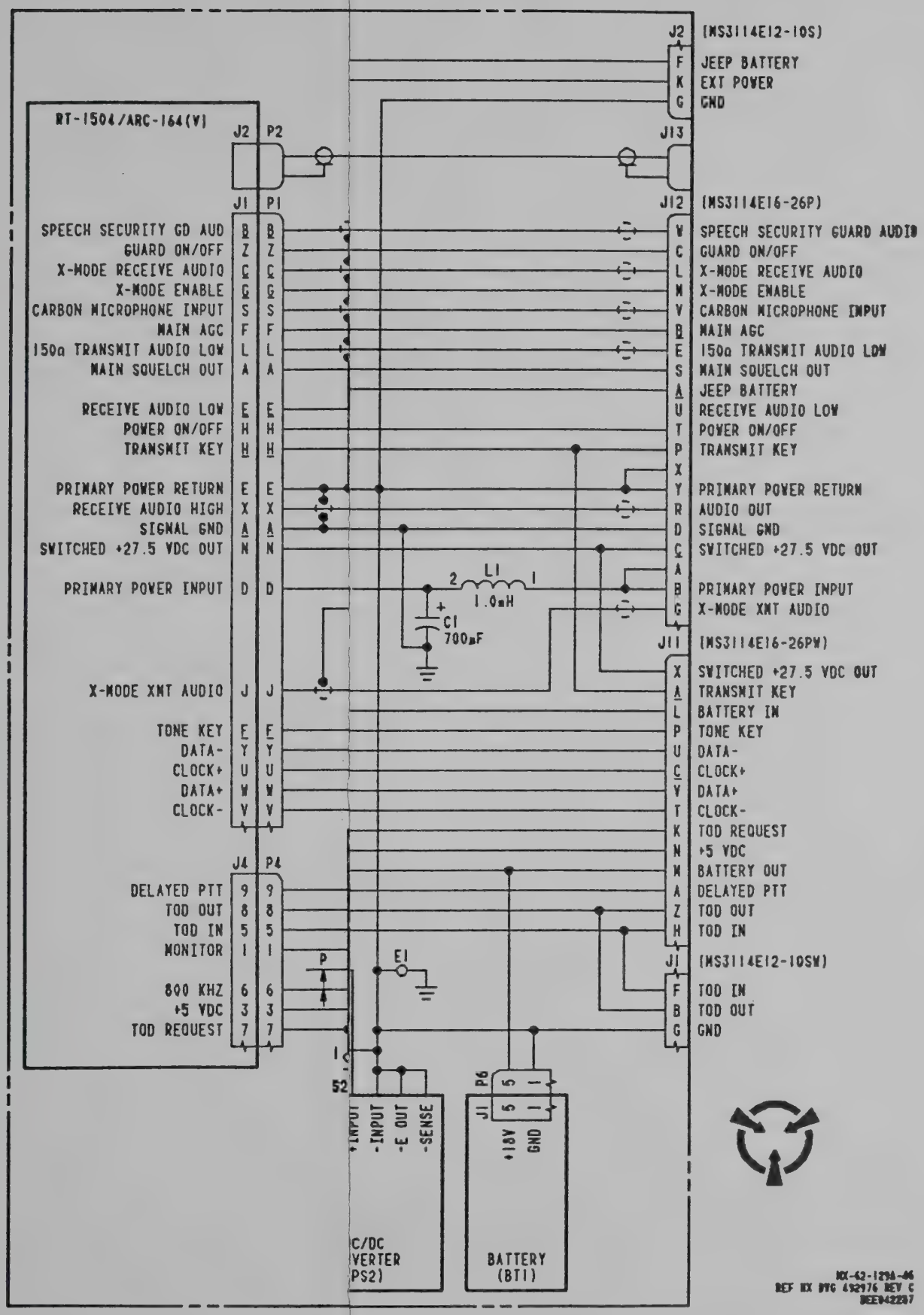
FO-14. Mounting Base MT-6165
Trouble Analysis (Sheet 2 of 2)



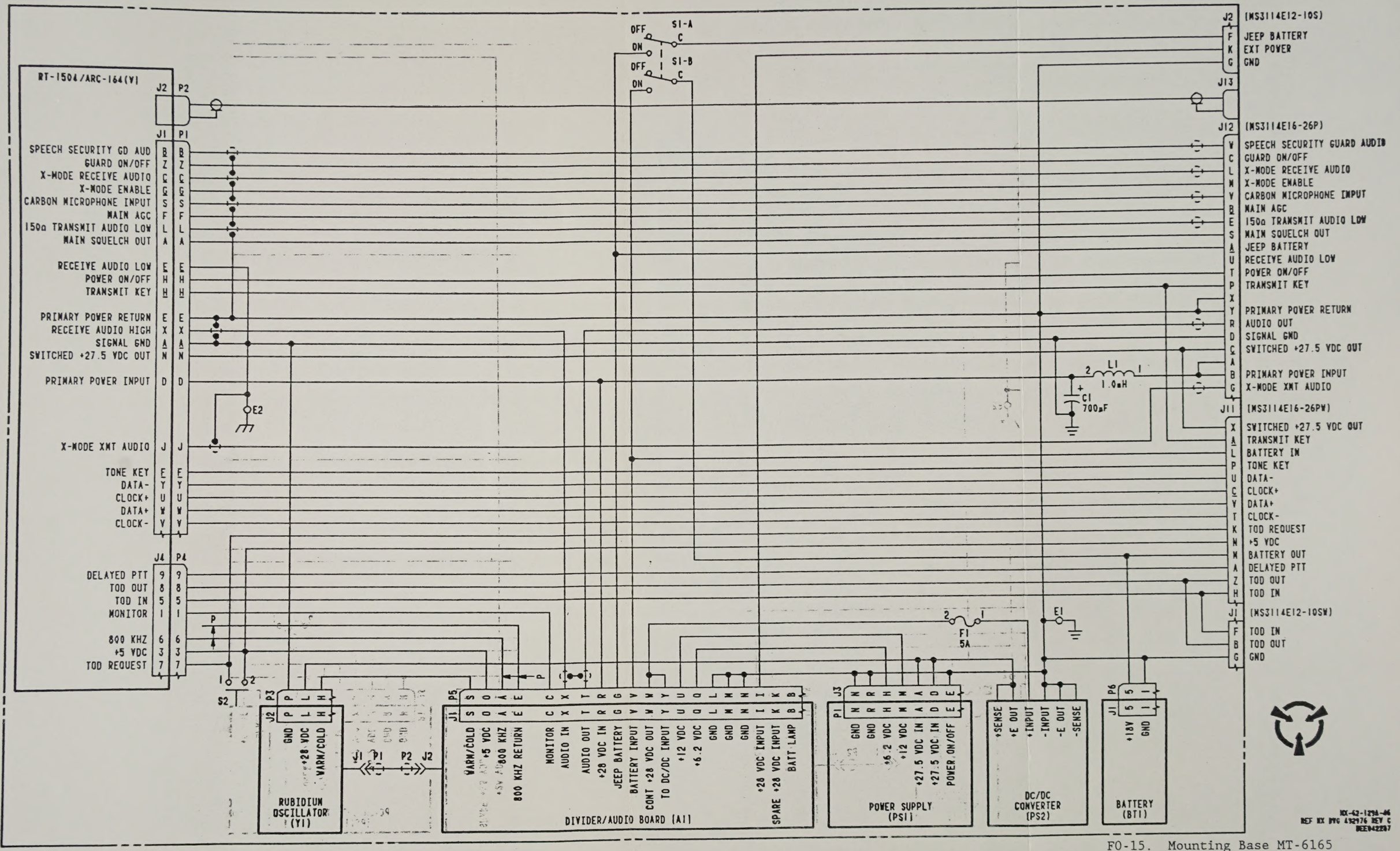
4. OSILLATOR NOT PROVIDING SYNC IN RT.
5. TRANSMIT OR RECEIVE FUNCTIONS FAIL, RT TESTS GOOD.

MX-52-129A-49-2
CRD042187

FO-14. Mounting Base MT-6165
Trouble Analysis (Sheet 2 of 2)



FO-15. Mounting Base MT-6165
Schematic Diagram



FO-15. Mounting Base MT-6165
Schematic Diagram